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NEW ENGLAND DIV APR 81

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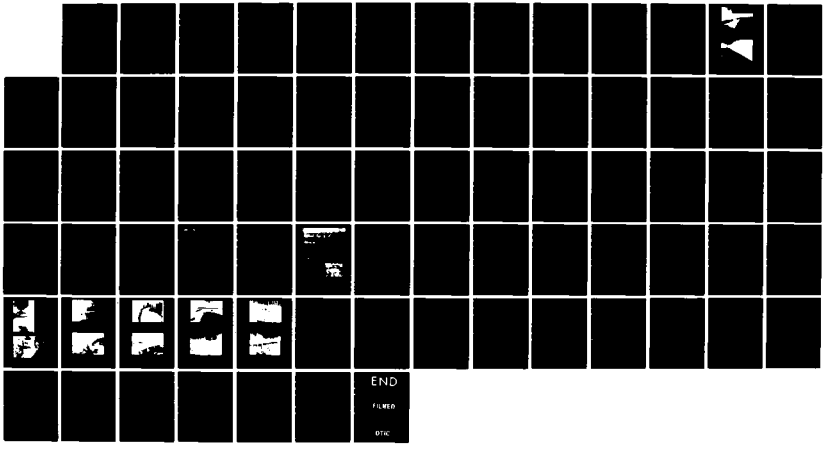
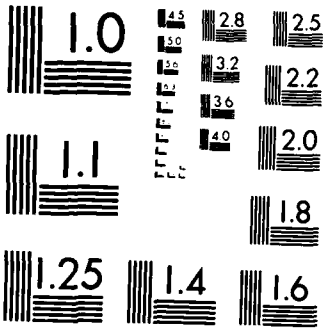




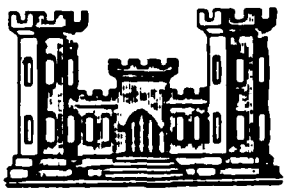
(2)

CONNECTICUT RIVER BASIN
COLRAIN, MASSACHUSETTS

SHELBURNE FALLS FIRE DISTRICT RESERVOIR DAM

MA 00462

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

APRIL 1981

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Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,
Connecticut River Basin
Colrain, Massachusetts
Fox Brook

20 ABSTRACT (Continue on reverse side if necessary and identify by block number)

This dam is a 71-year old earth embankment dam which impounds water for fire protection and provides a back up supply of water for Shelburne Falls distribution system. The dam appears to be in fair overall condition. It is small in size and has a hazard potential of significant. The recommended test flood for a dam this size is one half of the Probable Maximum Flood.

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SHELBURNE FALLS FIRE DISTRICT RESERVOIR DAM

MA 00462

CONNECTICUT RIVER BASIN
COLRAIN, MASSACHUSETTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION PROGRAM

Identification No.:	MA 00462
Name of Dam:	Shelburne Falls Fire District Reservoir Dam
Town:	Colrain
County & State:	Franklin County, MA
Stream:	Fox Brook
Date of Inspection:	December 3, 1980

BRIEF ASSESSMENT

Shelburne Falls Fire District Reservoir Dam is a 71-year old earth embankment dam which impounds water for fire protection and provides a back-up supply of water for Shelburne Falls distribution system. The dam is approximately 490 feet long and has a maximum height of about 28 feet. The upstream and downstream slopes of the embankment are each 2H:1V, except for a short reach of the downstream slope near the southern abutment which is on a slope of approximately 1.5H:1V. The crest of the dam is 15 feet wide for the northern 300 feet of the dam; the remaining portion tapers from 15 feet to a width of 8 feet at the southern abutment. A 27.5-foot wide concrete spillway is located at the northern dam abutment and a small gatehouse is located at the downstream toe, near the center of the dam.

The dam appears to be in fair overall condition. The downstream slope is irregular, but it appears to have been constructed that way. The most significant deficiency was noted in the vicinity of the low level outlet, where approximately 2 gpm of clear seepage was observed.

The dam has a maximum storage capacity of 47 acre-feet and a maximum height of 28 feet. The height of the dam falls within the 25 to 40 feet range established by the Army Corps of Engineers for "Small" size dams; consequently, Shelburne Falls Fire District Reservoir Dam is classified as a "Small" Dam. A breach of the dam with the reservoir surface at the top of the dam would cause property damage with possible loss of a few lives at the downstream damage area. Therefore, the dam is classified in the "Significant" hazard potential category. The recommended test flood for a "Small" size, "Significant" hazard dam is from the 100-year flood to one-half of the Probable Maximum Flood (PMF). Because of the relatively low height and storage capacity of the reservoir, the 100-year flood was chosen as the test flood.

The peak test flood inflow to the Shelburne Falls Fire District Reservoir was computed to be about 520 cfs. The corresponding test flood outflow of about 520 cfs passes over the spillway and overtops the dam by approximately 0.1 feet. With the flashboards in place, the spillway has a discharge capacity with the water in the reservoir at the crest of the dam of approximately 460 cfs, or 88 percent of the routed test flood. Assuming the flashboards are removed or fail prior to overtopping of the dam, the spillway is capable of passing approximately 1,170 cfs, or over twice the peak outflow anticipated to occur during the test flood.

Within one year after receipt of this Phase I Inspection Report, the Owner, the

Shelburne Falls Fire District, should retain the services of a qualified, registered professional engineer experienced in the design and construction of dams to: 1) investigate the source and nature of the seepage observed in the vicinity of the low-level outlet pipes and recommended appropriate corrective measures, and 2) provide an upstream means of operating the low level outlets so that the outlet pipes are not continously under hydrostatic pressure.

The Owner should also implement the following operation and maintenance measures; 1) fill the small animal holes at the downstream toe of the dam with suitable compacted material; 2) repair the spalling of the concrete on the buttresses of the spillway headwall: 3) remove and brush from the north side abutment area; 4) install riprap at the outlets of the two 8-inch diameter pipes; 5) remove the top 6-inch high flashboard so that the spillway will pass the test flood without overtopping of the dam; 6) develop a formal downstream warning plan; and 7) institute a program of annual technical inspection.

O'BRIEN & GERE ENGINEERS, INC.

John J. Williams

Date: 21 May 1981

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REGISTERED PROFESSIONAL ENGINEER

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation: however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does <u>not</u> include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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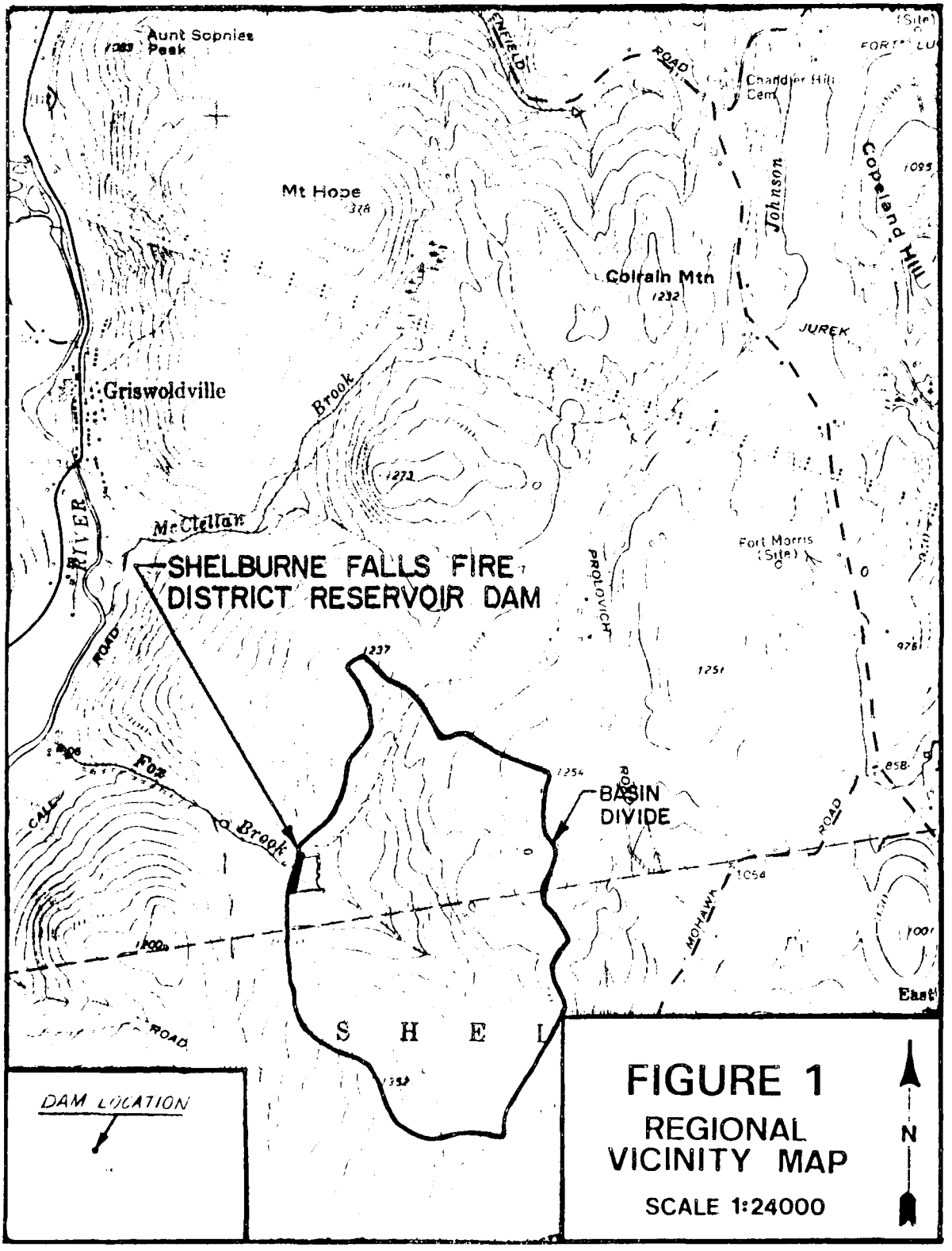
UPSTREAM OVERVIEW OF THE DAM FROM THE SOUTH ABUTMENT. (12/3/80)

DOWNSTREAM OVERVIEW OF THE DAM FROM THE NORTH SIDE OF THE SPILLWAY. (12/3/80)


Aunt Sophies Peak
Mt Hope
Griswoldville
Colrain Mtn
Chandler Hill Cem
Johnson
Copeland Hill
JUREK
Brook
McClellan
RIVER
ROAD
SHELBURNE FALLS FIRE DISTRICT RESERVOIR DAM
PROLOVICH
Fort Morris (Site)
BASIN DIVIDE
Fox
Brook
MOHAWK
S H E L
DAM LOCATION
FIGURE 1
REGIONAL VICINITY MAP
SCALE 1:24000
N

6. Develop a formal downstream flood warning plan.

7. Institute a program of annual technical inspection.

7.4 Alternatives

No valid alternatives to the recommendations and remedial measures described above are considered feasible for this site.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. Based upon the visual inspection, the dam appears to be in fair condition. The source of the clear seepage (2 gpm) is the vicinity of the outlet of the two 8-inch diameter low level outlet pipes should be investigated. The inoperable valve on the 10-inch diameter pipe in the center of the spillway headwall does not affect the safety of the dam since the two 8-inch diameter low level outlets are used for drawing down the reservoir. The minor spalling of the concrete on the buttresses of the spillway headwall should be repaired. The small animal holes at the downsteam toe of the dam should be filled.

b. Adequacy of Information. Sufficient information was obtained during the investigation and from the Shelburne Falls Fire District personnel to conduct a Phase I dam evaluation.

c. Urgency. The recommendations and remedial measures described in this Section should be implemented within one year of receipt of this Phase I inspection report.

7.2 Recommendations

The Owner, the Shelburne Falls Fire District should retain the services of a qualified, registered professional engineer, experienced in the design and construction of dams to:

1. Investigate the source and nature of the seepage observed at the outlet of the low level outlet pipes and recommend appropriate corrective measures.

2. Provide an upstream means of operating the low level outlets so that the outlet pipes are not continously under hydrostatic pressure.

7.3 Remedial Measures

The following operation and maintenance measures should be implemented by the Owner:

1. Fill the small animal holes at the downstream toe of the dam with suitable compacted material.

2. Repair the minor spalling of the concrete on the buttresses of the spillway headwall.

3. Remove trees and brush from the north side abutment area.

4. Install riprap at the outlets of the two 8-inch diameter pipes.

5. Remove the top 6-inch high flashboard so that the spillway will pass the test flood without overtopping of the dam.

SECTION 6

STRUCTURAL STABILITY

6.1 Visual Observations

The dam appears to be in fair overall condition. The entire embankment has a well maintained grass cover. The closest trees to the downstream toe of the dam (photo no. 3, Appendix C) are 20 feet away from the toe of the embankment. Clear seepage (about 2 gpm) was noticed around the outlet of the two 8-inch diameter cast iron low level outlet pipes. The concrete spillway appears to be in good condition except for some minor spalling on the two, four foot high buttresses.

6.2 Design and Construction Data

According to Mr. Harold Wheeler, representative of the Owner, no structural stability design or construction information is available for the dam.

6.3 Post Construction Changes

Modifications to the original dam were made in 1929. Information relative to the rebuilding is presented in Appendix B.

6.4 Seismic Stability

The Shelburne Falls Fire District Reservoir Dam is located in Seismic Zone 2 on the "Seismic Zone Map of Contiguous States". Therefore according to the "Recommended Guidelines for Phase I Dam Investigations", the dam need not be evaluated for seismic stability.

5.5 Dam Failure Analysis

A failure of the embankment was simulated by the HEC-1-DB computer program assuming a 100 feet wide and a 25.8 feet deep breach with vertical side slopes developing within fifteen minutes. Failure is assumed to occur with the reservoir surface at the top of the dam. This was compared with discharge through the spillway with the reservoir surface at the top of the dam with no failure. The resulting outflow was routed to a house trailer at the damage center approximately 3,500 feet downstream of the dam. The channel cross-section at this location is shown on page D-6.

The stream depths at the damage center were computed to be 4.8 feet and 2.3 feet for the breach and non-breach conditions, respectively. The discharge for the breach condition is about 3,420 cfs compared to about 510 cfs. for the non-breach condition. Approximately 2.8 feet of water would be expected in the house trailer if the dam were to breach. Even for the non-breach condition, 0.3 feet of water would be expected in the house trailer. A flood of this magnitude would cause appreciable property damage, with possible loss of a few lives. Therefore, the hazard classification for Shelburne Falls Reservoir Dam is "Significant".

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

The drainage area for Shelburne Falls Fire District Reservoir Dam is 0.6 square miles. The drainage area is mountainous, forested and undeveloped. The mountainous topography ranges from Elev. 1,320 to Elev. 847 at the normal pool elevation of the reservoir.

5.2 Design Data

According to the Owner's representative, hydraulic and hydrologic data used in the design of the structure are not available.

5.3 Experience Data

According to the Owner's representative, no rainfall or reservoir level records are maintained for the structure.

5.4 Test Flood Analysis

The recommended test flood for a "Small" size, "Significant" hazard dam is from the 100-year flood to one-half of the Probable Maximum Flood (PMF). Because of the relatively low storage capacity, the selected test flood is the 100-year flood.

Hydraulic and hydrologic calculations were performed with the assistance of the HEC-1-DB computer program. Flood hydrographs were developed from Snyder unit hydrographs using average coefficients, an initial infiltration value of zero and a constant loss rate of 0.05 inches per hour. The test flood runoff was reduced according to the "Hop Brook" reduction factor[1], a hypothetical value which takes into account the size of drainage area and the probability of the storm area coinciding with the drainage area. The routing analysis consisted of constructing the inflow hydrograph for the test flood and routing it over the dam. Stage vs. discharge and stage vs. storage relationships were developed to obtain the outflow hydrograph. The reservoir pool was assumed to be at the crest of the flashboards at the beginning of the test flood storm event.

The peak test flood inflow to the Shelburne Falls Fire District Reservoir Dam was computed to be about 520 cfs (870 CSM). The peak test flood outflow is also 520 cfs, which corresponds to a reservoir stage of approximately 2.9 feet above the top of the flashboards or about 0.1 feet above the top of the dam. The spillway (with the flashboards in place) is capable if discharging about 460 cfs or approximately 88 percent of the routed test flood outflow prior to overtopping of the dam. Under similar conditions, except with the flashboards removed, the spillway will pass approximately 1,170 cfs prior to overtopping of the dam.

[1]Corps of Engineers, Engineering Circular No. 1110-2-27, Aug. '66

SECTION 4

OPERATION AND MAINTENANCE PROCEDURES

4.1 Operation Procedures

a. General. The normal operational procedure consists of opening the 8-inch diameter gates of the low level outlet pipes to provide additional water during periods of low flow for the Shelburne Falls Fire District water supply system. The site is visited daily to ensure proper operation.

b. Description of Any Warning System in Effect. According to Mr. Harold Wheeler, the Owner's representative, no formal warning system is in effect.

4.2 Maintenance Procedures

a. General. The Shelburne Falls Fire District Reservoir Dam is maintained by the personnel of the Fire District's water supply system under the direction of Mr. Harold Wheeler. The personnel clear debris from the spillway, cut the grass on the embankment and perform other maintenance tasks as needed.

b. Operating Facilities. The two 8-inch diameter valves on the low level outlet system are opened at least twice a year to provide additional water to the water supply system during period of low flow. The 10-inch diameter valve on the 10-inch diameter pipe which passes through the spillway headwall has not been operated in many years.

4.3 Evaluation.

The dam appears to be well maintained. The inoperable 10-inch diameter valve on the pipe which passes through the spillway headwall is not of significance since the two 8-inch diameter low level outlet system pipes are available for reservoir drawdown and for providing additional water, when necessary, to the Shelburne Falls Fire District water supply system. A formal downstream warning plan should be developed.

3.2 Evaluation.

Based upon visual inspection, the dam appears to be in fair condition. The source of the seepage in the vicinity of the outlet of the two 8-inch diameter pipes should be investigated. The inoperable valve on the 10-inch diameter pipe in the center of the spillway headwall does not affect the safety of the dam since the two 8-inch diameter pipes of the low level outlet system are used for drawdown of the reservoir. The minor spalling of the concrete on the buttresses of the spillway headwall should be repaired. The small animal holes at the downstream toe of the dam should be filled and compacted with suitable material.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General. The Shelburne Falls Fire District Reservoir Dam was inspected on December 3, 1980. At the time of inspection, the reservoir surface was less than one inch above the top of the flashboards. Underwater areas were not inspected.

The observations and comments of the field inspection team are in the check list which is Appendix A of this report.

b. Dam. The dam appears to be in fair condition. The entire embankment has a well maintained grass cover.

A few small holes a few inches in diameter in the downstream toe of the dam appear to have been dug by burrowing animals. Clear seepage (about 2 gpm) was noticed in the vicinity of the outlet of the two 8-inch diameter cast iron low level outlet pipes. Clear water (about 1 gpm) was observed flowing out of the 4-inch diameter toe drain pipe. The valve operators for the two 8-inch diameter low level outlet pipes are in a wooden gatehouse near the downstream toe of the dam. The stone masonry wall downstream of the gatehouse, from which the low level outlet pipes protrude, appears to be in good condition. (See Photo 4, Appendix C).

c. Appurtenant Structures. The concrete spillway appears to be in good condition except for some minor spalling on the two four-foot high buttresses. Two-foot high wooden flashboards were observed on the spillway crest. The valve on the 10-inch diameter pipe extending through the spillway headwall was not visible, but according to the Owner's representative, this valve has not been operated in many years.

The valves on the two 8-inch diameter low level outlet pipes were operated by Shelburne Falls Fire District personnel during the inspection. These valves, however, should not be located at the downstream end of the outlet pipes, since such a condition will keep the pipe upstream of the valve constantly under pressure. See recommendations in Section 7.

d. Reservoir Area. The slope of the terrain along the perimeter of the reservoir averages about 20 percent. The slopes are well protected by dense vegetation with no signs of erosion.

e. Downstream Channel. The spillway outlet channel is a chute that narrows from 27.5 feet to an approximate width of 6 feet less than 20 feet downstream of the spillway. A few stones and token debris were observed in the channel. Fox Brook flows in a stone masonry channel to a circular holding reservoir approximately 1,100 feet downstream of the dam. Water in the holding reservoir is used to supply the Shelburne Falls Fire District water supply system. Excess water from the holding reservoir is discharged back into Fox Brook. Fox Brook continues downstream to the hazard area (3,500 feet from the dam) before flowing under the Call Road bridge and then discharging into North River, about 3,800 feet downstream from the dam.

SECTION 2

ENGINEERING DATA

2.1 Design

Design information for the original construction of the dam (circa 1910) is not available. Drawings and specifications for the 1929 reconstruction of the dam were provided by the Owner and are included in Appendix B.

2.2 Construction

According to the Owner's representative, no record of the original construction is available. Information relative to the 1929 improvements is shown in Appendix B.

2.3 Operation

According to the Owner's representative, the two 8-inch diameter low level outlet cast iron pipes are used to draw the reservoir down periodically as well as providing additional discharge to Fox Brook, as required. The 10-inch diameter cast iron pipe which passes through the spillway headwall may have been used in the past for maintaining a base flow in Fox Brook; however, the valve located on the upstream side of the spillway headwall is no longer operable according to the Owner's representative. During the winter months, the top flashboard (six-inches) is removed.

2.4 Evaluation

a. Availability. Information was obtained from the Shelburne Falls Fire District, which has been included in Appendix B.

b. Adequacy. Sufficient information was obtained during the investigation and from the Shelburne Falls Fire District personnel to conduct a Phase I dam evaluation.

c. Validity. Information obtained from the Shelburne Falls Fire District generally agrees with the data acquired during the field investigation.

g. Dam Data.

1.	Type	Earth Embankment
2.	Length	±490 feet
3.	Top Width	15 feet wide for the northern 300 feet of the dam tapering to 8 feet wide at the southern abutment
4.	Height	28 feet
5.	Side Slopes (Upstream)	2H:1V
	(Downstream)	2H:1V to 1.5H:1V at south abutment
6.	Zoning	Unknown
7.	Impervious Core	Puddled Core
8.	Cutoff	Collars at Outlets
9.	Grout Curtain	None

h. Diversion and Regulating Tunnel. Not applicable

i. Spillway.

1.	Type	Broad-crested
2.	Length of Weir	27.5 feet
3.	Crest Elevation (Flashboards in Place)	847.0
4.	Crest Elevation (Flashboards Not in Place)	844.8
5.	Gates	NA
6.	Upstream Channel	Impoundment
7.	Downstream Channel	Rectangular shape, concrete bottom, with stone masonry walls; depth varies from 5 feet to 8 feet; width varies from 6 feet to 8 feet.

j. Regulating Outlets.

1. Two 8-inch Diameter Pipes (See Photo 4, Appendix C)

a.)	Invert Elevation	± 822.0
b.)	Size	8-inch Diameter
c.)	Description	Cast Iron Pipes
d.)	Control Mechanism	Gate valves

2. Spillway Outlet Pipe (See Photo 2, Appendix C)

a.)	Invert Elevation	842.0
b.)	Size	10-inch Diameter
c.)	Description	Cast Iron Pipe
d.)	Control Mechanism	Inoperable Gate Valve

7. Total Spillway Capacity at Test Flood Elevation. See Section 1.3 b (4).

8. Total Project Discharge at Top of Dam. With flashboards in place and the 8-inch diameter valves open, the total project discharge at the top of dam is about 480 cfs. Assuming the flashboards are removed or fail, the total project discharge at top of dam is about 1,190 cfs.

9. Total Project Discharge at Test Flood Elevation. Assuming a test flood elevation of 849.9, the combined discharge capacity of the spillway, flow over the dam, and flow through the low level outlets is approximately 550 cfs with the flashboards in place and 1,270 cfs without the flashboards.

c. Elevation. (NGVD)

1.	Streambed at toe of Dam	±821.8
2.	Bottom of Cutoff	Variable
3.	Maximum Tailwater	Unknown
4.	Normal Pool (Flashboards in Place)	847.0
5.	Full Flood Control Pool	NA
6.	Spillway Crest (Flashboards Removed)	844.8
7.	Spillway Crest (Flashboards in Place)	847.0
8.	Design Surcharge (Original Design)	Unknown
9.	Top of dam	849.8
10.	Test Flood Design Surcharge	849.9

d. Reservoir Length. (Feet)

1.	Normal Pool	400
2.	Flood Control Pool	NA
3.	Spillway Crest Pool (Flashboards Removed)	380
4.	Spillway Crest Pool (Flashboards in Place)	400
5.	Top of Dam	450
6.	Test Flood Pool	455

e. Storage. (Acre-Feet)

1.	Normal Pool	34
2.	Flood Control Pool	NA
3.	Spillway Crest Pool (Flashboards Removed)	29
4.	Spillway Crest Pool (Flashboards in Place)	34
5.	Top of Dam	47
6.	Test Flood Pool	48

f. Reservoir Surface. (Acres)

1.	Normal Pool	4.0
2.	Flood Control Pool	NA
3.	Spillway Crest (Without Flashboards)	3.7
4.	Spillway Crest (Top of Flashboards)	4.0
5.	Top of Dam	5.5
6.	Test Flood Pool	5.6

e. Ownership. The dam is owned by the Shelburne Falls Fire District. The Owner's representative is Mr. Harold Wheeler, Water Commissioner. He may be contacted at his office on 9 Williams Street, Shelburne Falls, MA 01370. Telephone (413) 625-6392.

f. Operator. The dam is operated by Water Commission personnel under the direction of Mr. Harold Wheeler.

g. Purpose of the Dam. The dam is used as a reservoir for water supply and fire protection in the Shelburne Falls Fire District.

h. Design and Construction History. The design and construction history of the original dam, built about 1910, is unknown. The dam was reconstructed in 1929 when it was raised, lengthened and widened. Drawings and specifications for the 1929 reconstruction are included in Appendix B.

i. Normal Operating Procedures. Depending upon the weather conditions, additional discharge is available through the two 8-inch diameter cast iron pipes (outlet inverts Elev. ±822) which function as low level outlets. The discharge from the low level outlets, along with the spillway discharge, is conveyed via Fox Brook, to the lower reservoir. In general, the reservoir water surface is kept within a few inches of the crest of the flashboards, Elev. 847. The low level outlets are operated at least twice a year.

1.3 Pertinent Data

a. Drainage Area. The drainage area for the Shelburne Falls Fire District Reservoir is 0.6 square mile. The entire area is undeveloped and primarily forested. The topography is mountainous, ranging from El. 1, 320 to 847 at normal pool elevation.

b. Discharge at Damsite.

1. Outlet Works. The low level outlets of the reservoir consists of two 8-inch diameter cast iron pipes controlled by two 8-inch diameter valves. These pipes, with outlet inverts at El. ± 822, are used to draw the reservoir down and to provide additional water during periods of low flow for the Shelburne Falls Fire District water supply system. With the water surface at the top of the dam, their combined discharge capacity is approximately 17 cfs.

2. Maximum Known Flood. Unknown.

3. Ungated Spillway Capacity at Top of Dam. The ungated spillway capacity at the top of dam El. 849.8, assuming the flashboards are in place, is about 460 cfs. Assuming that the flashboards are removed or fail prior to overtopping, the spillway capacity at top of dam El. 849.8 is approximately 1,170.

4. Ungated Spillway Capacity at Test Flood Elevation. The ungated spillway capacity at test flood Elevation 849.9 is about 490 cfs with the flashboards in place and about 1,210 cfs without the flashboards.

5. Gated Spillway Capacity at Normal Pool Elevation. Not Applicable.

6. Gated Spillway Capacity at Test Flood Elevation. Not Applicable.

2H:1V with riprap paving to within 2 feet of the top of the dam. For a distance of approximately 300 feet from the spillway at the northern end of the embankment, the crest is 15 feet wide and the slope of the downstream face of the embankment is 2H:1V. From this point, the crest narrows to 8 feet in width and the slope of the downstream face of the embankment steepens to approximately 1.5H:1V at the southern abutment.

The dam was originally constructed with a vertically puddled core (see Page B-2). The puddled core was extended on a slope parallel to the upstream face of the dam to the widened crest (see page B-2) when the dam was raised in 1929.

A wooden gatehouse is located at the downstream toe near the center of the dam (see page B-1). The building contains two 8-inch diameter gate valves located on two 8-inch diameter cast iron pipes that function as low level outlets. The two 8-inch diameter pipes outlet at the downstream toe of the dam through a stone wall to the discharge channel. A 4-inch diameter pipe which conveys discharge from the internal drainage system of the dam outlets into the discharge channel about 20 feet downstream of the wall.

The spillway is located at the north abutment of the dam and consists of a vertical concrete wall, 27.5 feet long supported by two 4-foot high concrete buttresses equally spaced at the downstream face of the spillway wall. Two-foot high wooden flashboards are located on the crest of the spillway. A 10-inch diameter cast iron pipe, with an invert about 3 feet below the crest of the spillway, passes through the spillway wall near the center of the spillway. A gate valve is mounted on the pipe on the reservoir side of the headwall. The gate valve is always under water and the Owner's representative reported that is has not been operated for many years.

Downstream of the spillway, the discharge channel has a concrete invert and 5-foot high vertical stone sidewalls. It varies in width as it winds southwesterly under a small wooden walkway and through a stand of pine trees (See Photo 5, Appendix C). The concrete invert ends about 20 feet downstream of the bridge, where the discharge channel is approximately 8 feet wide. The discharge channel then continues approximately parallel to the dam, until it joins the outlet channel of the low level outlet. The outlet channel extends perpendicular from the dam with an approximately 10-foot wide bottom and variable side slopes.

c. Size Classification. Shelburne Falls Fire District Reservoir Dam has a maximum height of approximately 28 feet and a maximum storage capacity of 47 acre-feet. Its storage capacity would not qualify it for inclusion in the inspection program, since it does not fall within the 50 to 1,000 acre-feet range established by the Corps of Engineers for "Small" size dams. However, its height falls with the 25 to 40 feet range established by the Corps for "Small" size dams. Therefore, the Shelburne Falls Fire District Reservoir Dam is classified as a "Small" size dam.

d. Hazard Classification. The flood impact area is located about 3,500 feet downstream of the dam where a house trailer is located adjacent to Fox Brook. The breach analysis indicates that failure of the dam with the reservoir surface at the top of the dam would result in a depth flow of 2.8 feet above the door sill elevation of the house trailer. Appreciable property damage would result, with possible loss of a few lives. Therefore, Shelburne Falls Fire District Reservoir Dam is classified as a "Significant" hazard structure.

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

SECTION 1

PROJECT INFORMATION

1.1 General

a. Authority. The National Dam Inspection Act (Public Law 92-367) was passed by Congress on August 8, 1972. Under this Act, the Secretary of the Army was authorized to initiate, through the Corps of Engineers, the National Program for Inspection of Dams throughout the United States. Responsibility for supervising inspection of dams in the New England Region has been assigned to the New England Division of the Army Corps of Engineers.

O'Brien & Gere Engineers, Inc. has been retained by the New England Division to inspect and report on selected non-federal dams in the Commonwealth of Massachusetts. Authorization and Notice to Proceed were issued to O'Brien & Gere Engineers, Inc. by a letter dated November 12, 1980 and signed by Col. William E. Hodgson, Jr. Contract No. DACW33-81-C-0016 has been assigned by the Corps of Engineers for this work.

b. Purpose. The purpose of inspecting and evaluating non-federal dams is to:

1. Identify conditions which threaten public safety and make the Owner aware of any deficiencies so that he may correct them in a timely manner.

2. Encourage and prepare the state to initiate an effective dam safety program for non-federal dams as soon as possible.

3. Update, verify and complete the National Inventory of Dams.

1.2 Description of Project (Information for this dam was obtained from the Shelburne Falls Fire District office.)

a. Location. Shelburne Falls Fire District Reservoir Dam is located on Fox Brook in the Town of Colrain, Massachusetts. A portion of the USGS Quadrangle map entitled "Colrain, Mass-VT." has been included as Figure 1 on page vi of this report to illustrate the location. USGS reference coordinates for this dam are N42°38.3' and W72°42.2'.

Water from the reservoir flows in Fox Brook to a circular holding reservoir approximately 1,100 feet downstream of the dam. At this point a portion of the discharge is piped into the Shelburne Falls Fire District water supply system and the remainder continues to flow in Fox Brook to the confluence with North River approximately 3,800 feet downstream of the dam. The hazard area consists of two house trailers approximately 3,500 feet downstream of the dam.

b. Description of Dam and Appurtenances. Shelburne Falls Fire District Reservoir Dam is an earth embankment approximately 490 feet long with a maximum height of 28 feet. The upstream face of the embankment is on a slope of

APPENDIX A

CHECKLIST
VISUAL INSPECTION

VISUAL INSPECTION CHECK LIST

INSPECTION TEAM ORGANIZATION

Project: Shelburne Falls Fire District Reservoir Dam

National I.D.#: MA 00462

Location: Colrain, Massachusetts

Type of Dam: Earth Fill

Inspection Date(s): December 3, 1980

Weather: Cloudy, Cold 30°F

Pool Elevation: ± 847 NGVD

Inspection Team

Lee DeHeer	O'Brien & Gere	Managing Engineer
Leonard Beck	O'Brien & Gere	Structures
Steven Snider	O'Brien & Gere	Foundations & Materials
Alan Hanscom	O'Brien & Gere	Structures
Denis Mehu	Bryant Associates, Inc.	Hydrology/Hydraulics

Owner's Representative

Mr. Harold Wheeler of the Water Commission for

Shelburne Falls, MA

VISUAL INSPECTION CHECK LIST

Project: Shelburne Falls Fire District Reservoir Dam

National I.D. #: MA 00462

Date : December3, 1980

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	± 849.8
Current Pool Elevation	847.0
Maximum Impoundment to Date	Unknown
Surface Cracks	None
Pavement Condition	N.A.
Movement or Settlement of Crest	None observed.
Lateral Movement	None observed.
Vertical Alignment	None observed.
Horizontal Alignment	No misalignment observed.
Condition at Abutment and at Concrete Structures	Satisfactory, no erosion observed.
Indications of Movements of Structural Items on Slopes	None observed.
Trespassing on Slopes	No sign of trespassing on slopes.
Vegetation on Slopes	The slopes are well maintained. Grass is cut.
Sloughing or Erosion of Slopes or Abutments	None observed.
Rock Slope Protection - Riprap Failures	Along the entire length of the upstream face of the embankment. No riprap problems noted.

VISUAL INSPECTION CHECK LIST

Project: Shelburne Falls Fire District Reservoir Dam

National I.D. #: MA00462

Date : December 3, 1980

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT (Con't)	
Unusual Movement or Cracking at or near Toes	None observed.
Unusual Embankment or Downstream Seepage	Seepage (2gpm) noted at outlet of 2,8-inch diameter reservoir drains.
Piping or Boils	None observed.
Foundation Drainage Features	Clear discharge (1gpm) from 4-inch diameter pipe which is outlet for internal drainage system. Pipe outlets into discharge channel for the reservoir drain system about 20 feet downstream of the dam.
Toe Drains	
Instrumentation System	None on site.

VISUAL INSPECTION CHECK LIST

Project: Shelburne Falls Fire District Reservoir Dam

National I.D. #: MA00462

Date : December 3, 1980

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	No approach channel. Discharge comes directly from the reservoir
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
b. Weir and Training Walls	
General Condition of Concrete	Good.
Rust or Staining	None observed.
Spalling	Minor spalling on the faces of the buttresses.
Any Visible Reinforcing	No
Any Seepage or Efflorescence	No
Drain Holes	None
c. Discharge Channel	Good, clear of debris.
General Condition	

VISUAL INSPECTION CHECK LIST

Project: Shelburne Falls Fire District Reservoir Dam

National I.D. #: MA 00462

Date : December 3, 1980

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WIER, APPROACH AND DISCHARGE CHANNELS (Con't)	
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	Few branches
Floor Channel	Concrete clear of debris.
Other observations	Concrete channel with stone masonry walls narrows as it progresses downstream.

VISUAL INSPECTION CHECK LIST

Project: Shelburne Falls Fire District Reservoir Dam

National I.D. #: MA 00462

Date : December 3, 1980

AREA EVALUATED	CONDITIONS
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	Approach channel & intake structure for the outlet works (reservoir drain system) are located at the bottom of the reservoir and could not be observed during the inspection.
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	
Condition of Concrete	
Stop Logs and Slots	

VISUAL INSPECTION CHECK LIST

Project: Shelburne Falls Fire District Reservoir Dam

National I.D. #: MA 00462

Date(s): December 3, 1980

AREA EVALUATED	CONDITIONS
OUTLET WORKS - TRANSITION AND CONDUIT	
General Condition of Concrete	The outlet works (reservoir drain system) conduit consists of 2, 8-inch diameter cast iron pipes which can be observed only at their discharge end at the downstream toe of the dam. The pipes appear to be in satisfactory condition where they can be observed.
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

VISUAL INSPECTION CHECK LIST

Project: Shelburne Falls Fire District Reservoir Dam

National I.D. #: MA 00462

Date : December 3, 1980

AREA EVALUATED	CONDITIONS
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	N/A
Rusting or Staining	Rust colored staining noted on stone masonry of headwall, stones and vegetation at outlet of reservoir drain.
Spalling	N/A
Erosion of Cavitation	None observed.
Visible Reinforcing	N/A
Any Seepage or Efflorescence	About 2gpm observed at outlet of reservoir drain pipes.
Condition at Joints	N/A
Drain Holes	N/A
Channel	
Loose Rock or Trees Overhanging Channel	A few overhanging branches.
Condition of Discharge Channel	Satisfactory.

APPENDIX B

CHECKLIST
ENGINEERING DATA

APPENDIX B

ENGINEERING DATA

TABLE OF CONTENTS

	PAGE
Plan of Dam	B-1
Section A-A	B-2
View of the Spillway & Section B-B	B-3
Specifications for Enlarging Dam in 1929	B-4 through B-7
Plan of 1929 Spillway Modification	B-8
1929 Spillway Modification Sections	B-9
Elevation: 1929 Spillway Modification (West)	B-10
Elevation: 1929 Spillway Modification (South)	B-11
Section Reservoir Drain System	B-12
Dam Inspection Report, 1977	B-13 & B-14

The originals for pages B-4 through B-11 available at the Shelburne Falls Town Hall.

BRYANT ASSOCIATES, INC.
648 Beacon Street
BOSTON, MASSACHUSETTS 02215
(617) 247-1800

JOB

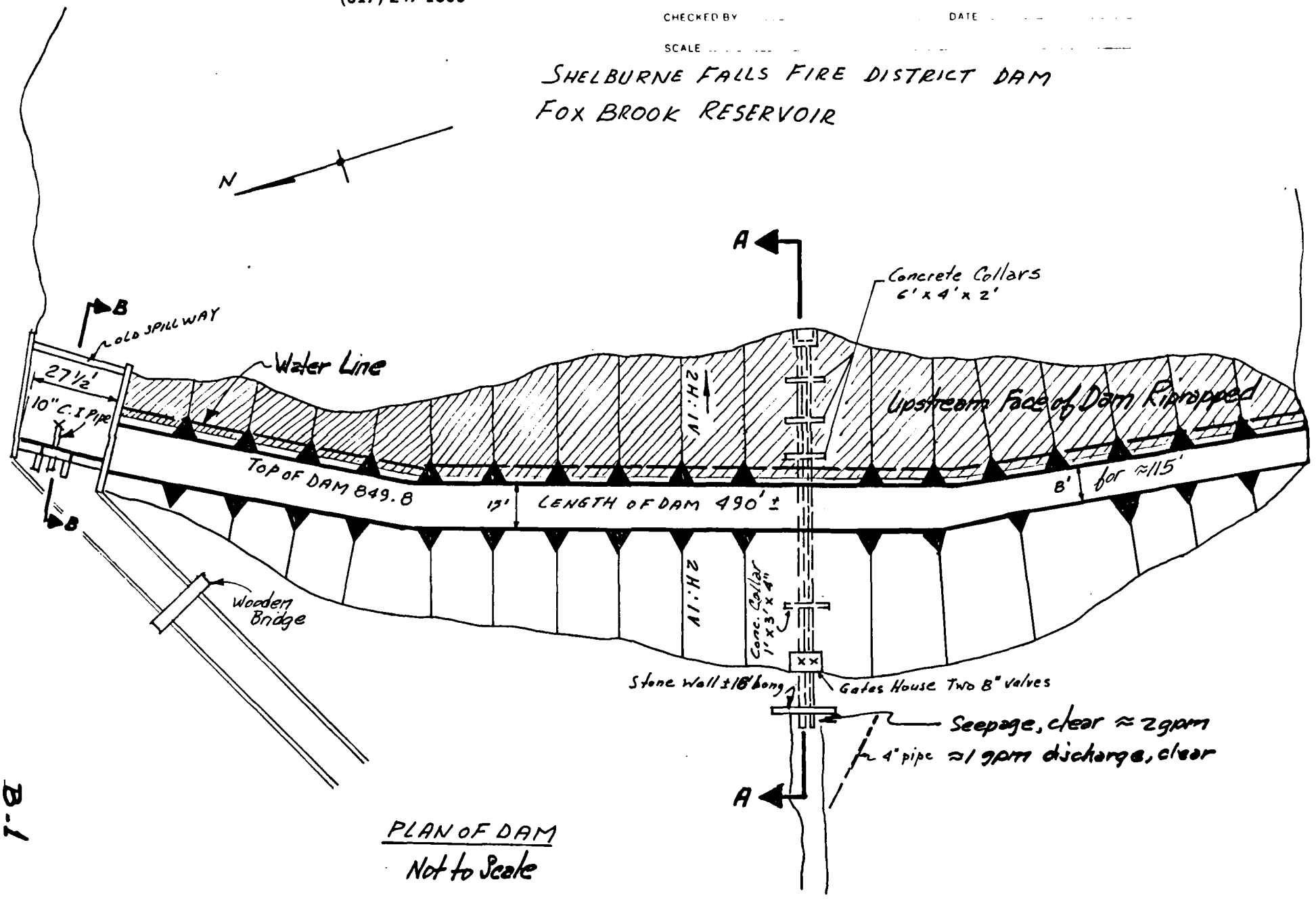
SHEET NO. OF

CALCULATED BY DATE

CHECKED BY DATE

SCALE

SHELBURNE FALLS FIRE DISTRICT DAM
FOX BROOK RESERVOIR

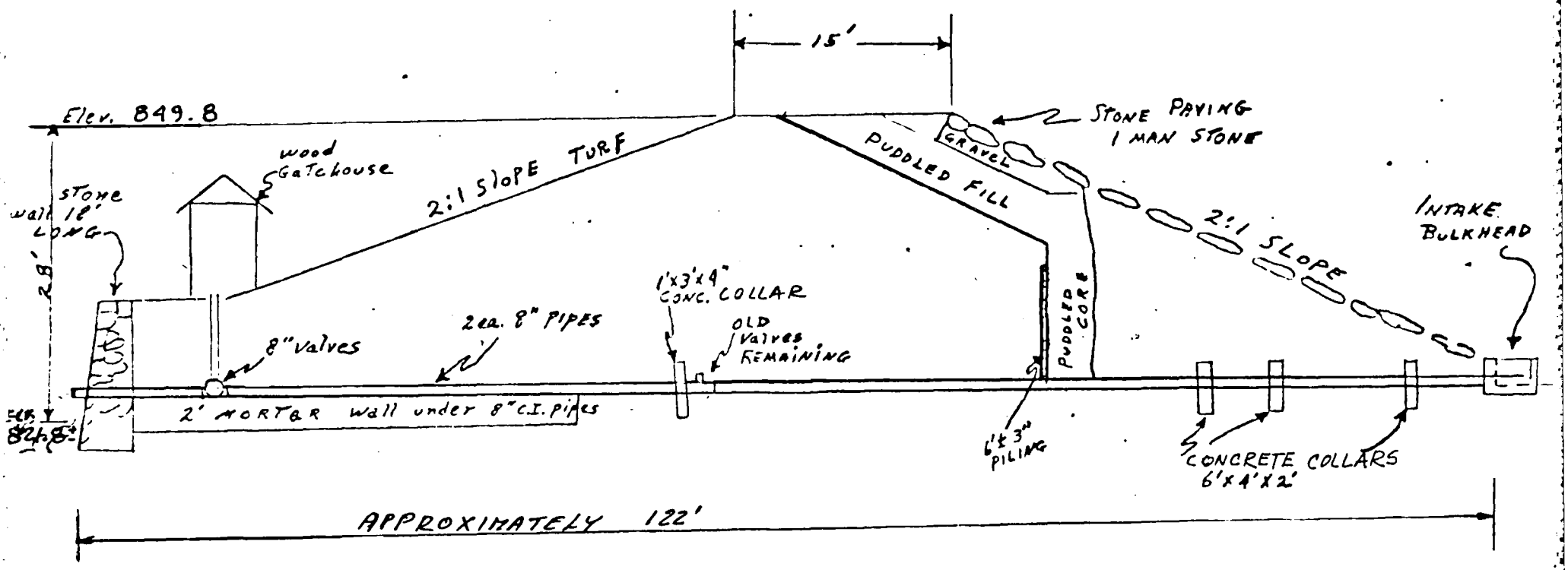


PLAN OF DAM
Not to Scale

B-1

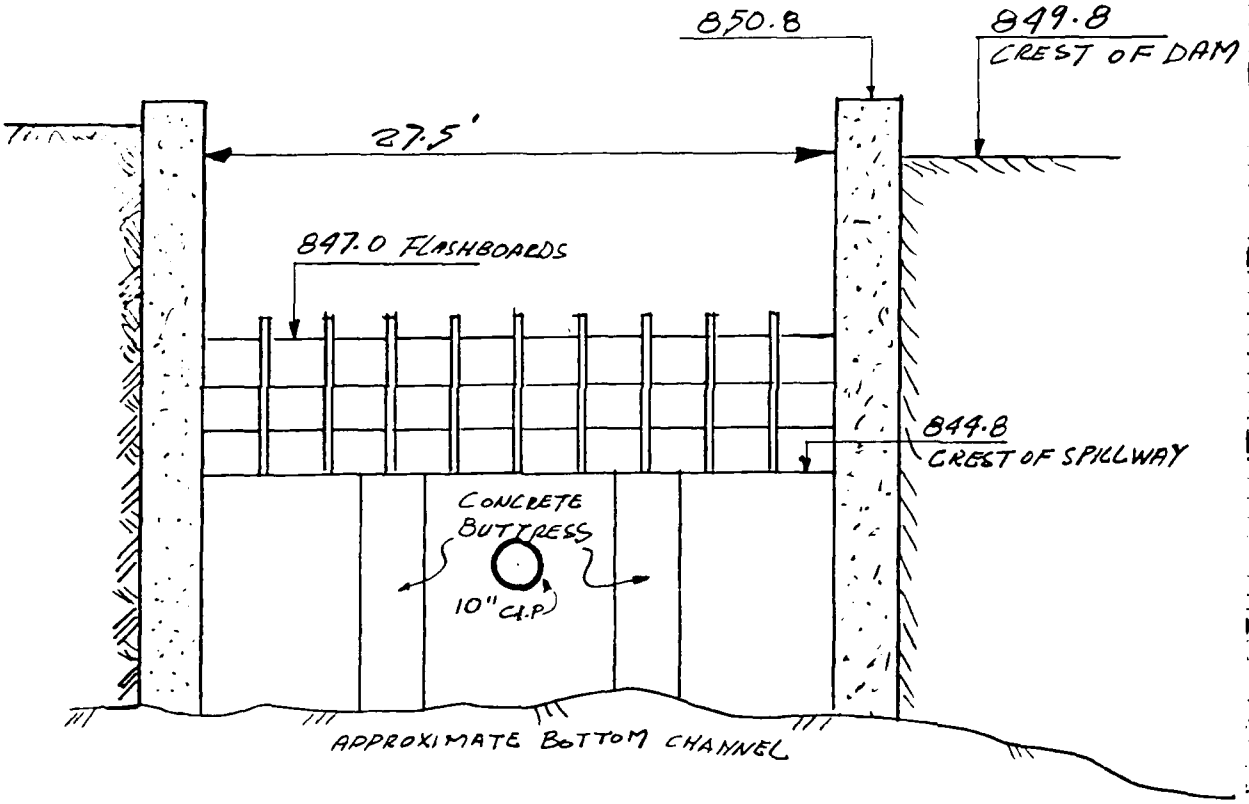
BRYANT ASSOCIATES, INC.
648 Beacon Street
BOSTON, MASSACHUSETTS 02215
(617) 247-1800

SHEET NO. OF
CALCULATED BY DATE
CHECKED BY DATE
SCALE



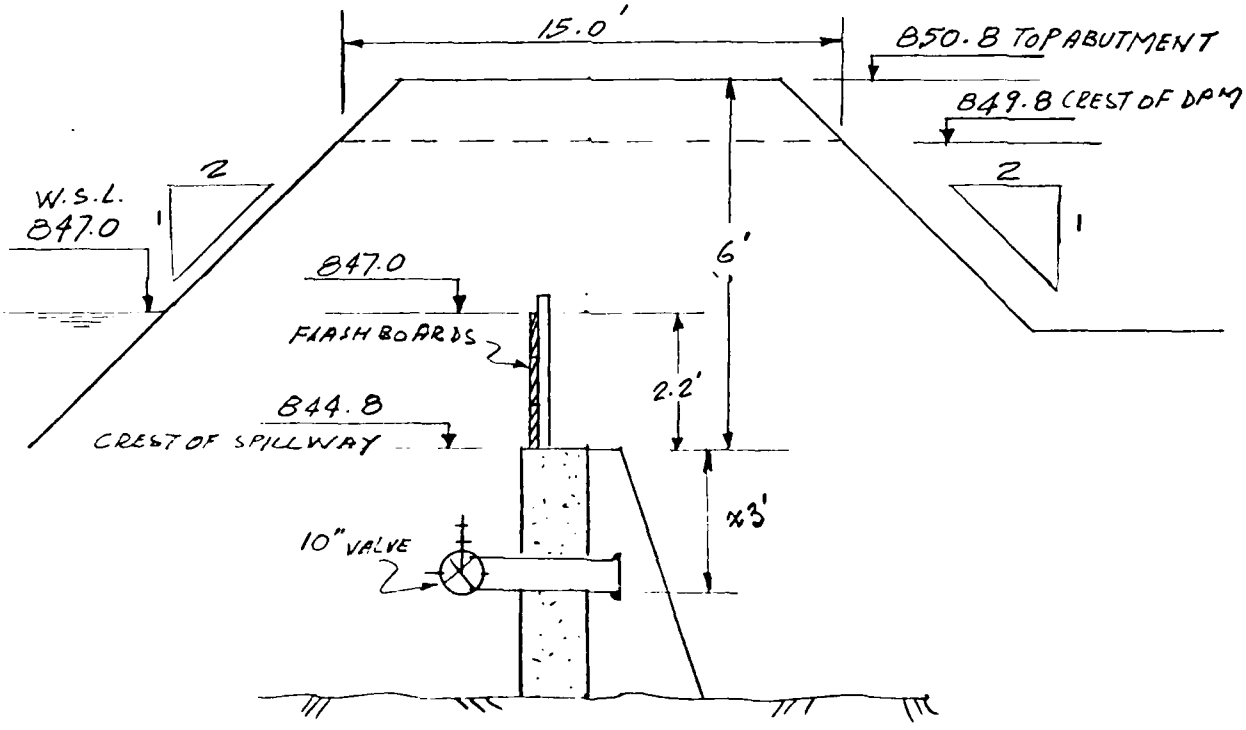
SECTION AA

B-2



VIEW OF THE SPILLWAY

BRYANT ASSOCIATES, INC.
648 Beacon Street
BOSTON, MASSACHUSETTS 02215
(617) 247-1800

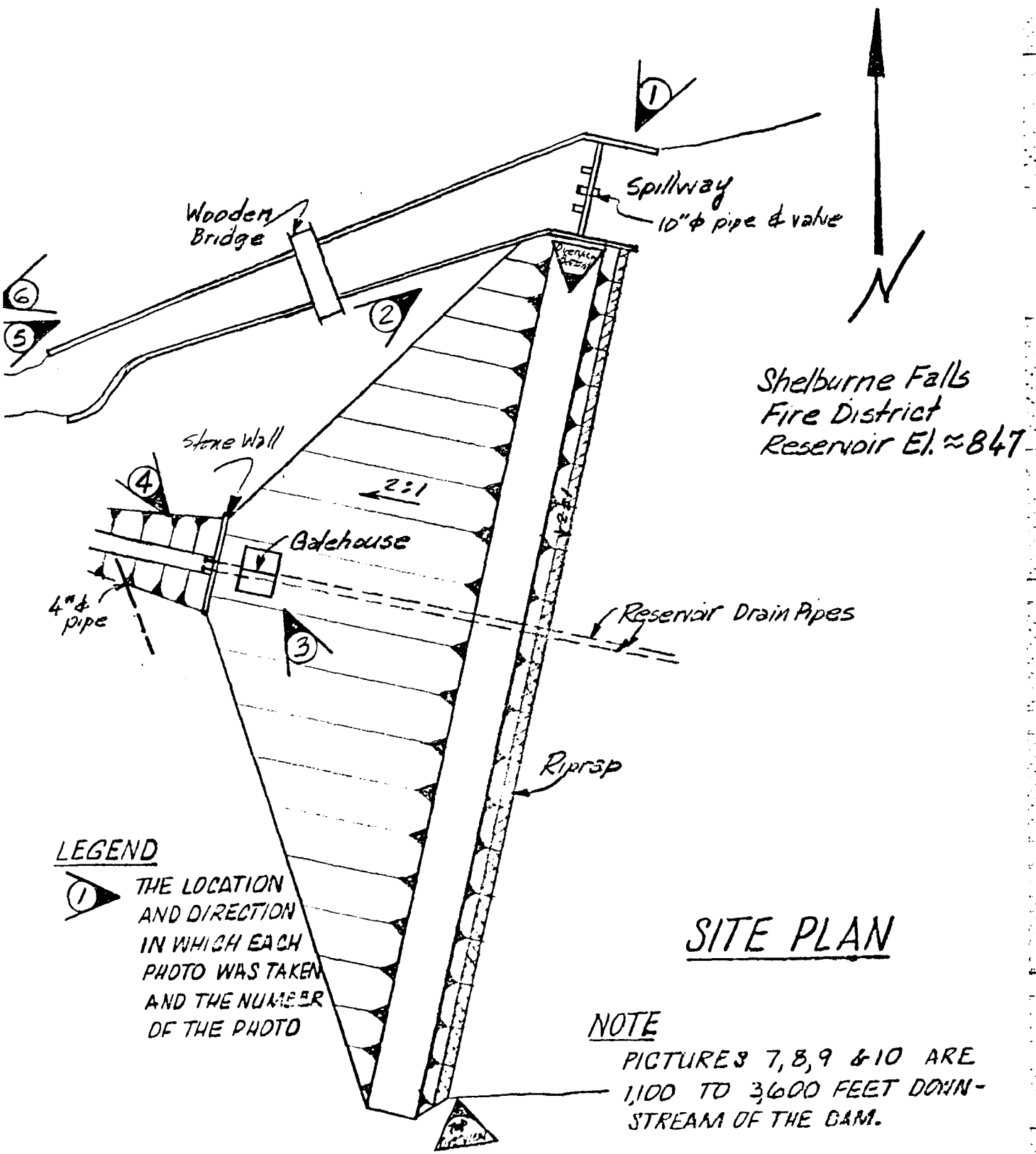


SECTION - BB

B-3

O'BRIEN & GERE
ENGINEERS, INC.

JECT	SHEET	BY	DATE	JOB NO
Shelburne Falls Fire District Res. Dam	A			



APPENDIX C
SELECTED PHOTOGRAPHS OF THE PROJECT

		Page No.
Site location plan		A
PHOTOGRAPHS		
No.		
1.	View along centerline of the dam from the north abutment. (12/3/80)	1
2.	Downstream face of the spillway showing flash boards in place. (12/3/80)	1
3.	Gatehouse at the downstream toe of the dam. (12/3/80)	2
4.	Low level outlet at the downstream toe of the dam. (12/3/80)	2
5.	Typical lined channel downstream of the spillway outlet channel. (12/3/80)	3
6.	Typical unlined channel downstream of the spillway outlet channel. (12/3/80)	3
7.	Holding pond about 1,100 feet downstream of the dam.of the dam.	4
8.	Potential damage area about 3,500 feet downstream of the dam. (12/3/80)	4
9.	Potential damage area about 3,500 feet downstream of the dam. (12/3/80)	5
10.	Road crossing over downstream channel approximately 3,600 feet downstream of the dam. (12/3/80)	5

APPENDIX C

PHOTOGRAPHS

REMARKS AND RECOMMENDATIONS
DAM #2-6-66-2A
OCTOBER 18, 1976

The dam appears to receive satisfactory maintenance. The turfed embankment was well mowed and clear of any brush growth. The flash boards on the spillway level were still at summer season elevation but Mr. Wheeler stated the top board would be removed shortly for the winter, increasing the free board by 6 inches. Minor spalling of the north abutment of the spillway and minor spalling on the face of the crest and dropwall were noted. This spalling does not appear to be hazardous to safety of dam at present time. A cast iron pipe near base of spillway dropwall, approximately 10" in diameter, and a gate valve on upstream side of spillway were noted. The gate valve has not been operated for many years, per water department personnel, and it is questionable if it could be operated at present time. It would appear that the reservoir level is now controlled by the 2-8 inch pipes located near center of the dam, which would explain lack of usage and maintenance of 10" pipe in spillway drop wall.

The southerly of the twin 8 inch C.I. pipe has a flow of several G.P.M. issuing from outlet end. Per Mr. Wheeler, this flow is due to a faulty gate valve seal and is therefore not a hazard to dam itself. On last inspection of 11-6-74, it was noted that there was evidence of minor seepage at base of stone masonry end wall at outlet ends of the twin 8 inch pipes. At this present inspection three leaks, or flows of water were noted. These flows are each approximately 1 to 1½ inches in diameter where they come out of the ground at base of end wall. The ground in the area is extremely soft and a stick was noted a short distance downstream of one of these flows, but on day of inspection all three flows appeared clear. This condition was discussed with Mr. Wheeler during the inspection and he stated he would maintain a close check on these leaks for any change or increase in amount of flowage.

At the southerly end of dam a minor seepage condition was noted at toe of slope. This is mostly an area of damp ground with some evidence of standing water in ground depressions. The surrounding terrain contours are such that this seepage could be ground water from side slopes rather than seepage through the dam. Due to an error of location found in original sketches filed with inspection reports of 6-14-72, a revised sketch is enclosed with this report showing proper location of spillway. Areas of seepage and leaks are marked in red on this revised sketch as found on 10-18-76.

Dam appears to still be basically sound and safe but the leaks at base of end wall at outlet of 8" diameter C.I. pipes would appear to require an investigation as to source of origin and possible hazard to safety of dam.

B-4

The Commonwealth of Massachusetts

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL QUALITY ENGR.
DIVISION OF WATERWAYS

100 Nashua Street, Boston 02114

Shelburne Falls Fire District
9 Williams Street
Shelburne Falls, Ma.
ATTN: Mr Harold Wheeler

March 8, 1977

Re: Inspection Dam #2-6-66-2A
Shelburne Falls Fire District
Reservoir Dam
Colrain, Ma.

Dear Sir:

On October 18, 1976, an Engineer from the Massachusetts Department of Public Works made a visual inspection of the above dam. Our records indicate the owner to be Shelburne Falls Fire District. If this information is incorrect will you please notify this office.

The inspection was made in accordance with the provisions of Chapter 253 of the Massachusetts General Laws as amended (Dams Safety Act). Chapter 706 of the Acts of 1975 transferred the jurisdiction of the so-called "Dams Safety Program" to the Commissioner of the Department of Environmental Quality Engineering.

The results of the inspection indicate that this dam is safe; however, the following conditions were noted that require attention:

SEE REMARKS AND RECOMMENDATIONS ON ~~REVERSE SIDE.~~
B-14

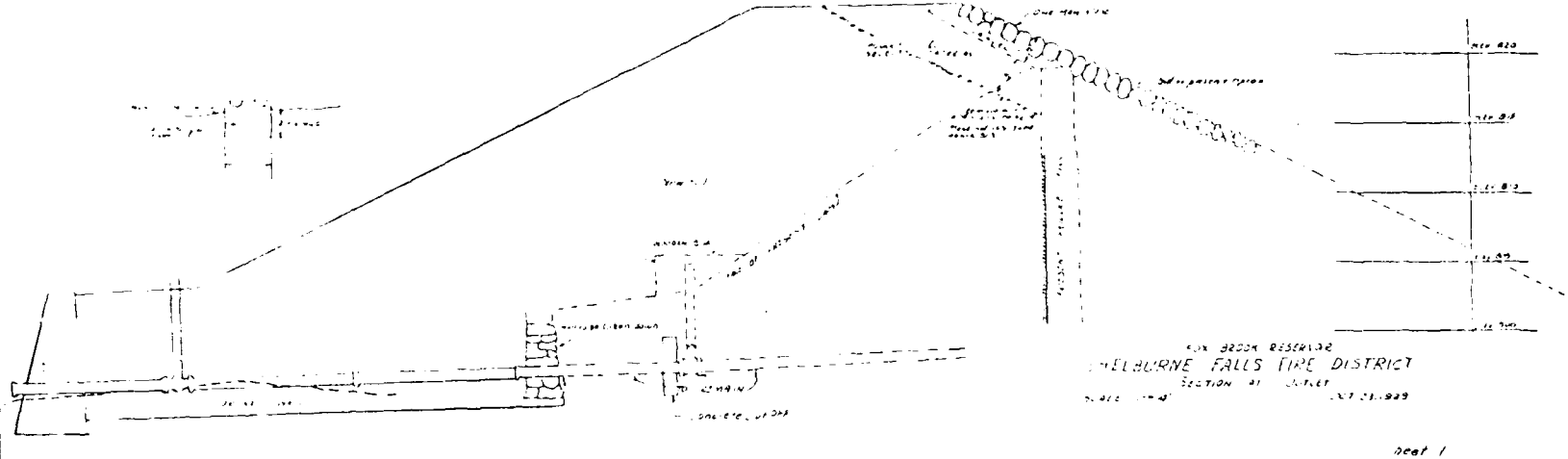
We call these conditions to your attention before they become serious and more expensive to correct. With any correspondence please include the number of the Dam as indicated above.

Very truly yours,

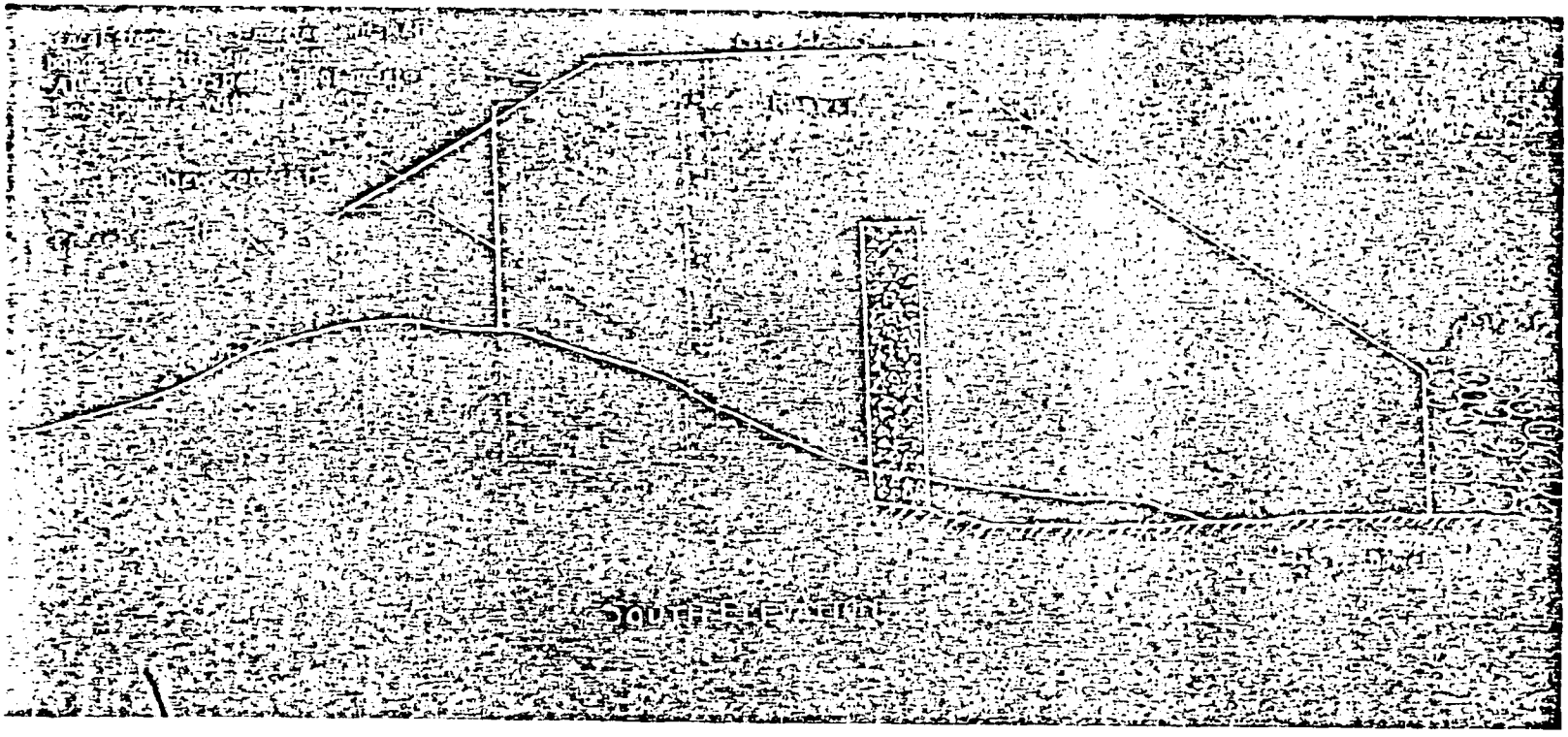
John J. Hannon, P.E.
Chief Engineer

cc: Francis J. Hoey
Russell Salls
File

B-13

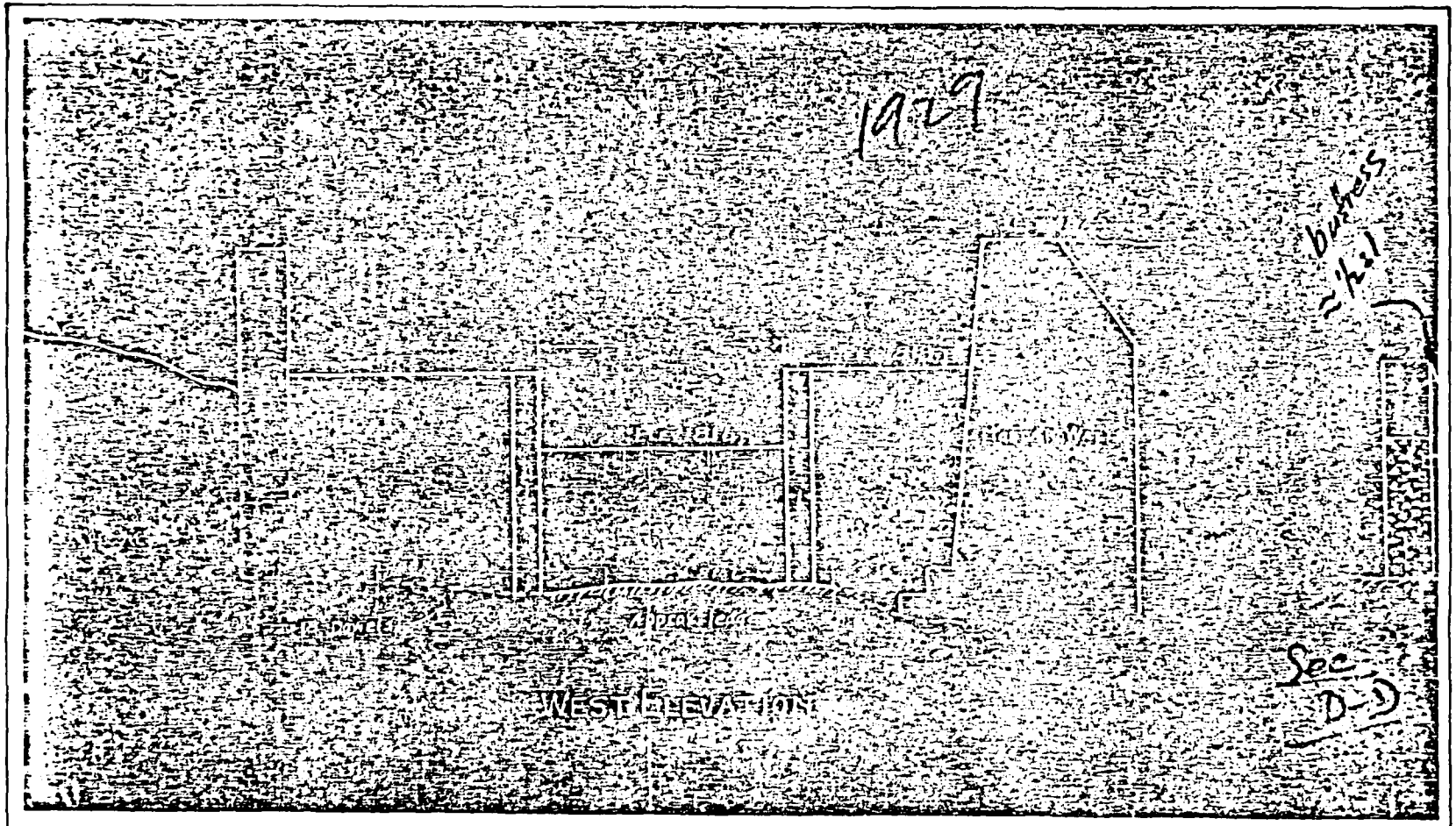


U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION	
CONTRACT NO. DACW 33-81-C-0016 Shelburne Falls Fire District	
Section RESERVOIR DRAIN SYSTEM	
O'BRIEN & GERE	Date: March, 1981 Scale:
	B-12

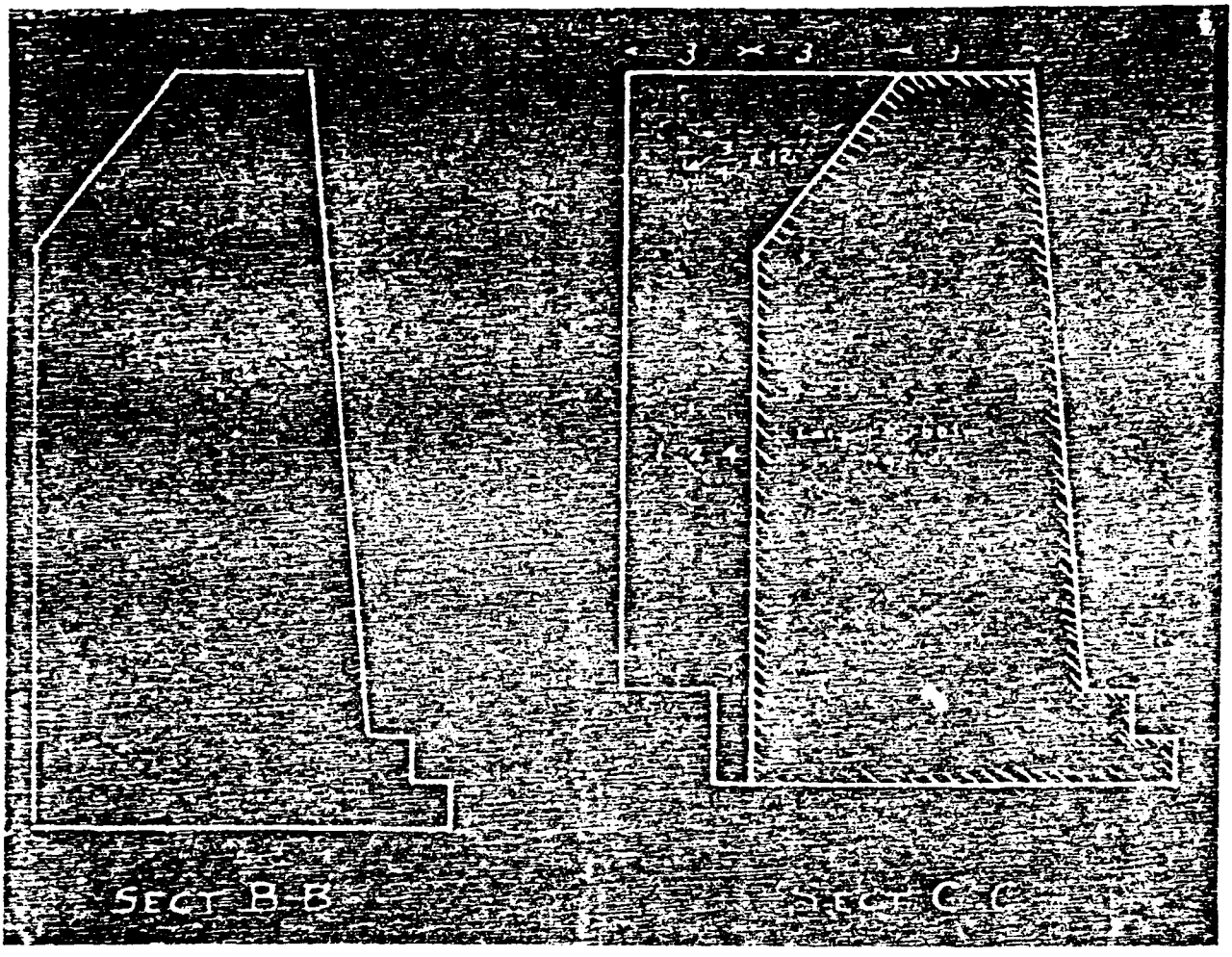


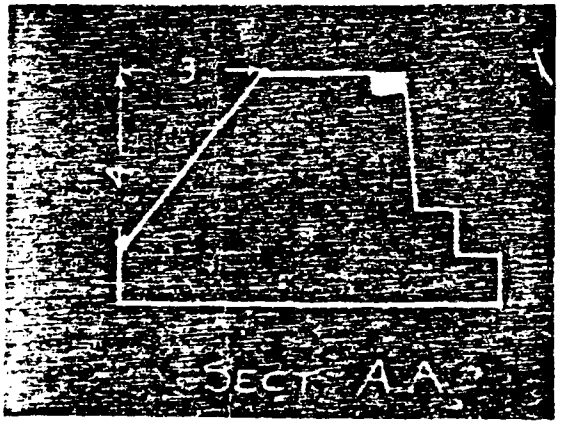
U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION	
CONTRACT NO. DACW 33-81-C-0016 Shelburne Falls Fire District	
Elevation: 1929 Spillway Modification (SOUTH)	
O'BRIEN & GERE	Date: March, 1981 Scale:

B-11



U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION	
CONTRACT NO. DACW 33-81-C-0016 Shelburne Falls Fire District	
Elevation - West Preliminary Submission (A-1)	
OBRIEN & GERE	Date March, 1981 Scale

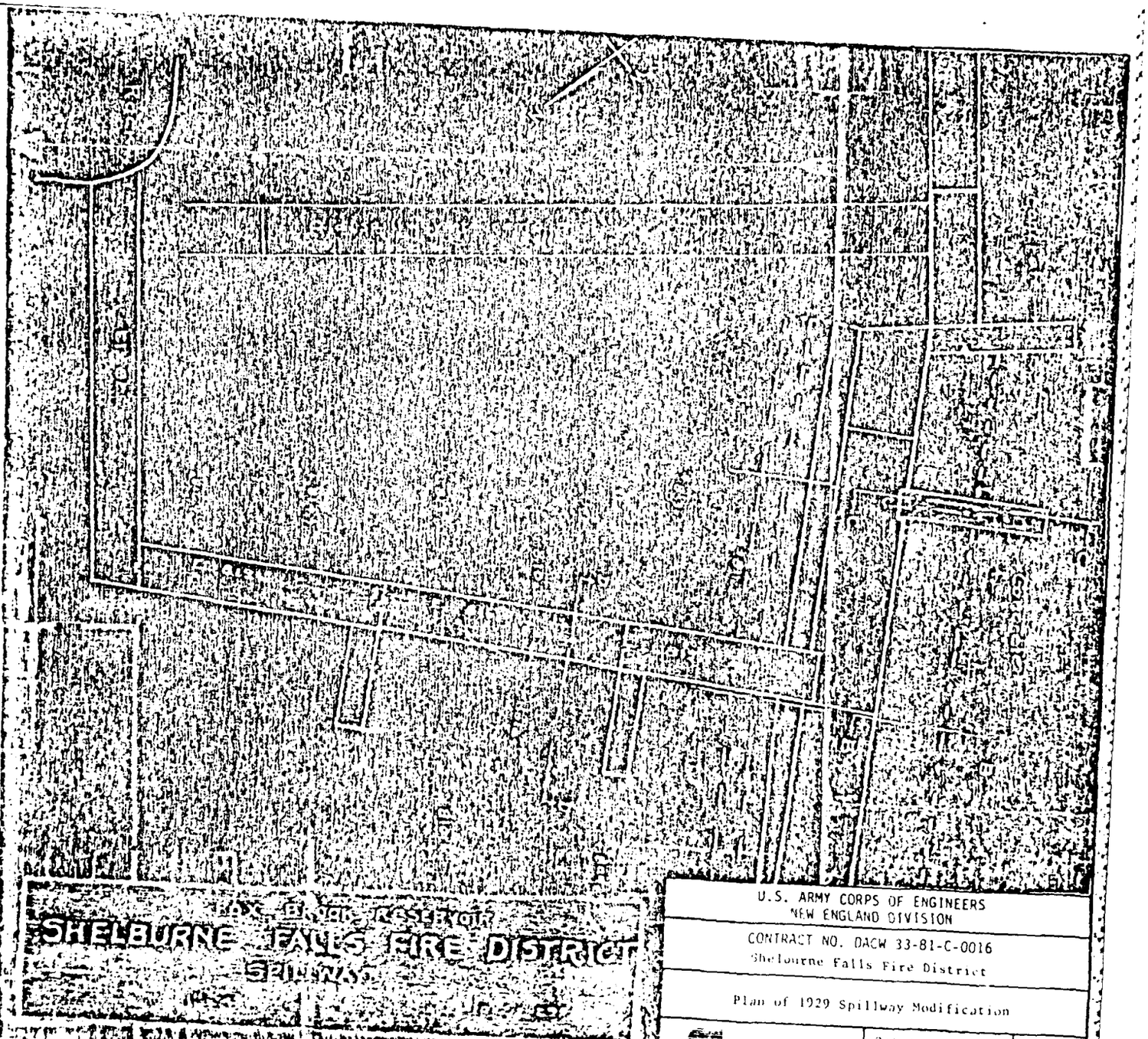




U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		
CONTRACT NO. DACW 33-81-C-0016		
Shelburne Falls Fire District Dam		
1929 SPILLWAY MODIFICATION Sections		
OBRIEN & GERE	Date: March, 1981 Scale:	B-9

Note:

Sections A-B, C-C, and A-A are included on page B-9. An elevation of the revised spillway is shown on page B-3.



U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DIVISION

CONTRACT NO. DACW 33-81-C-0016
Shelburne Falls Fire District

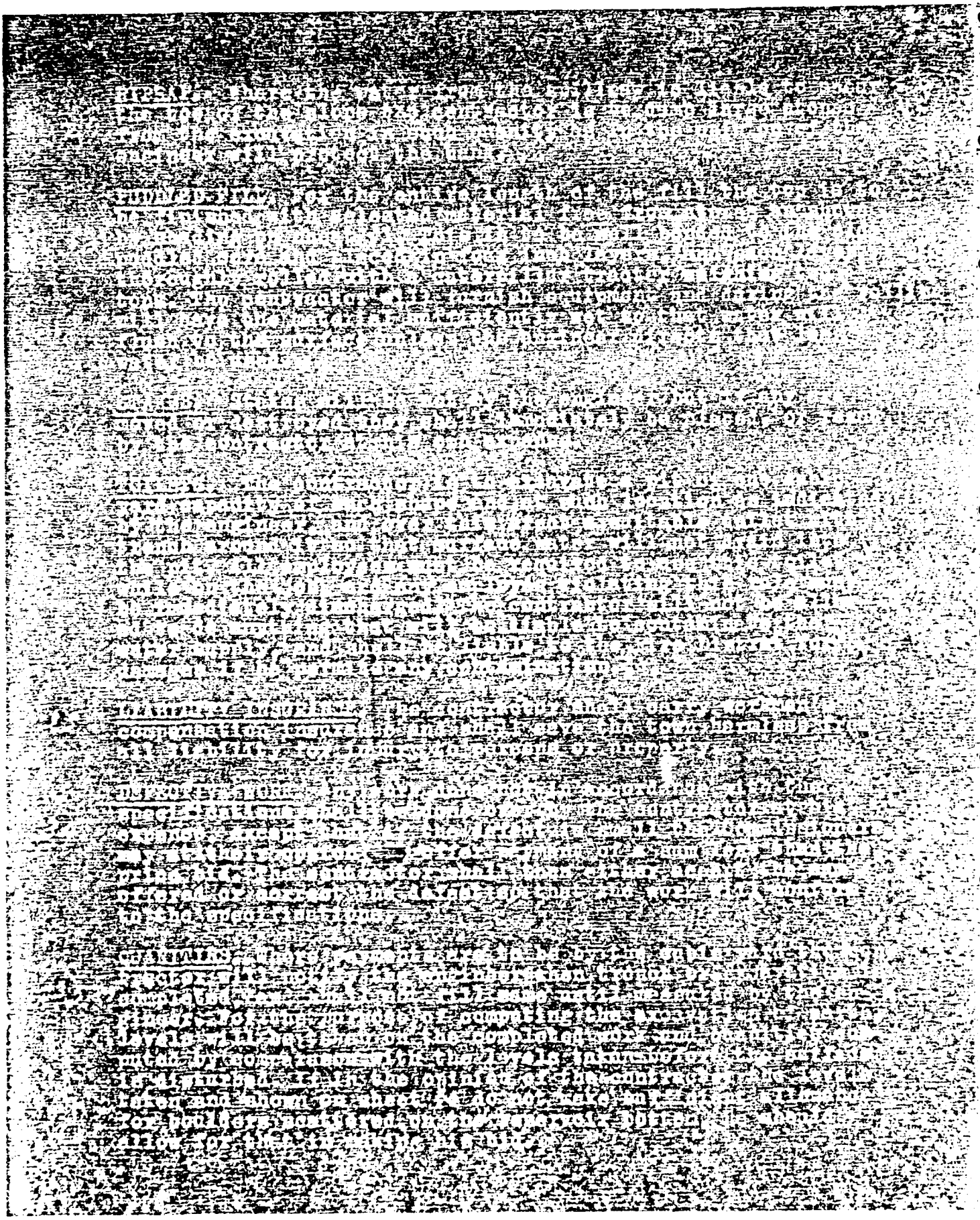
Plan of 1929 Spillway Modification

OBRIEN & GERE

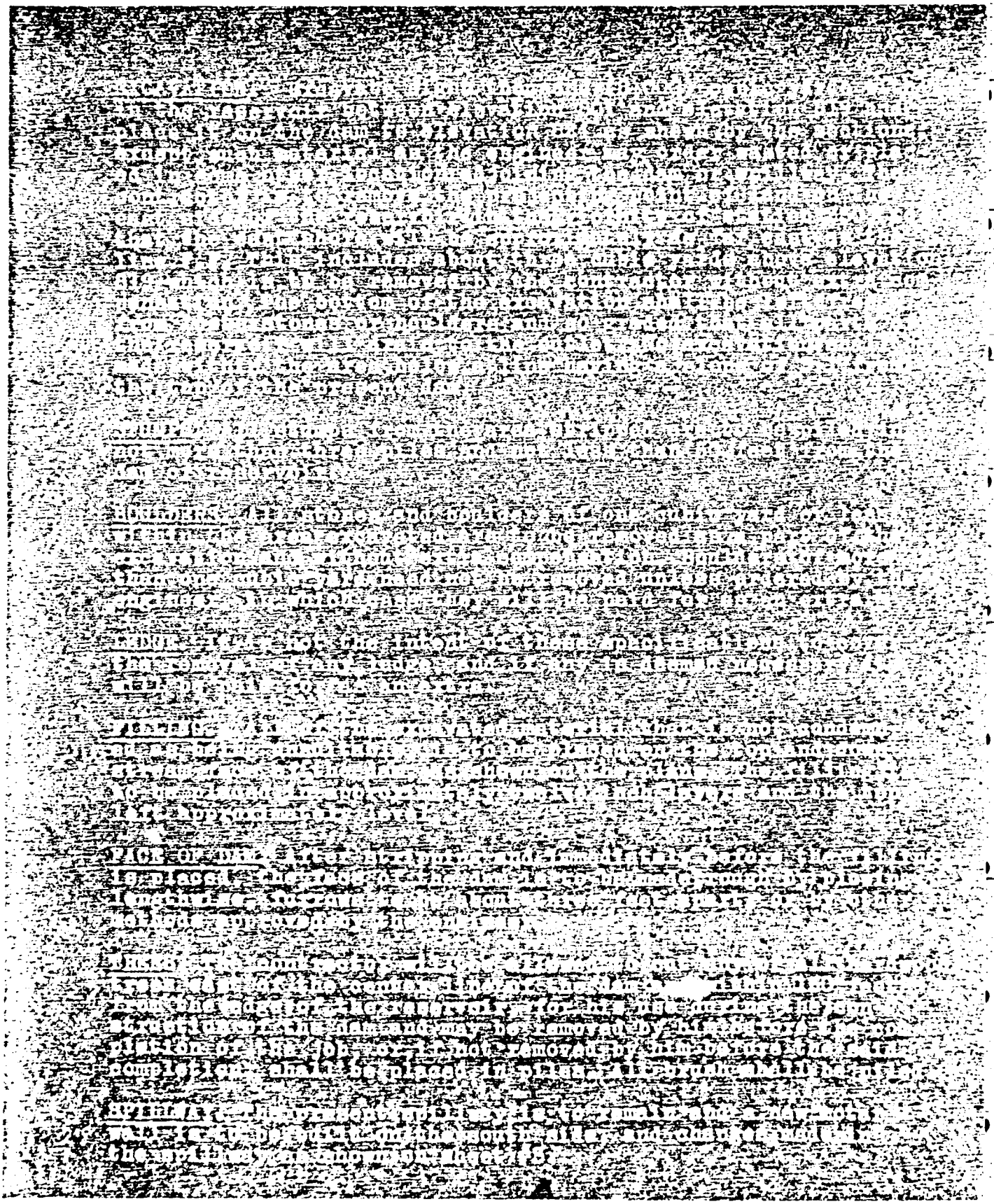
Date: March, 1981
Scale.

B-8

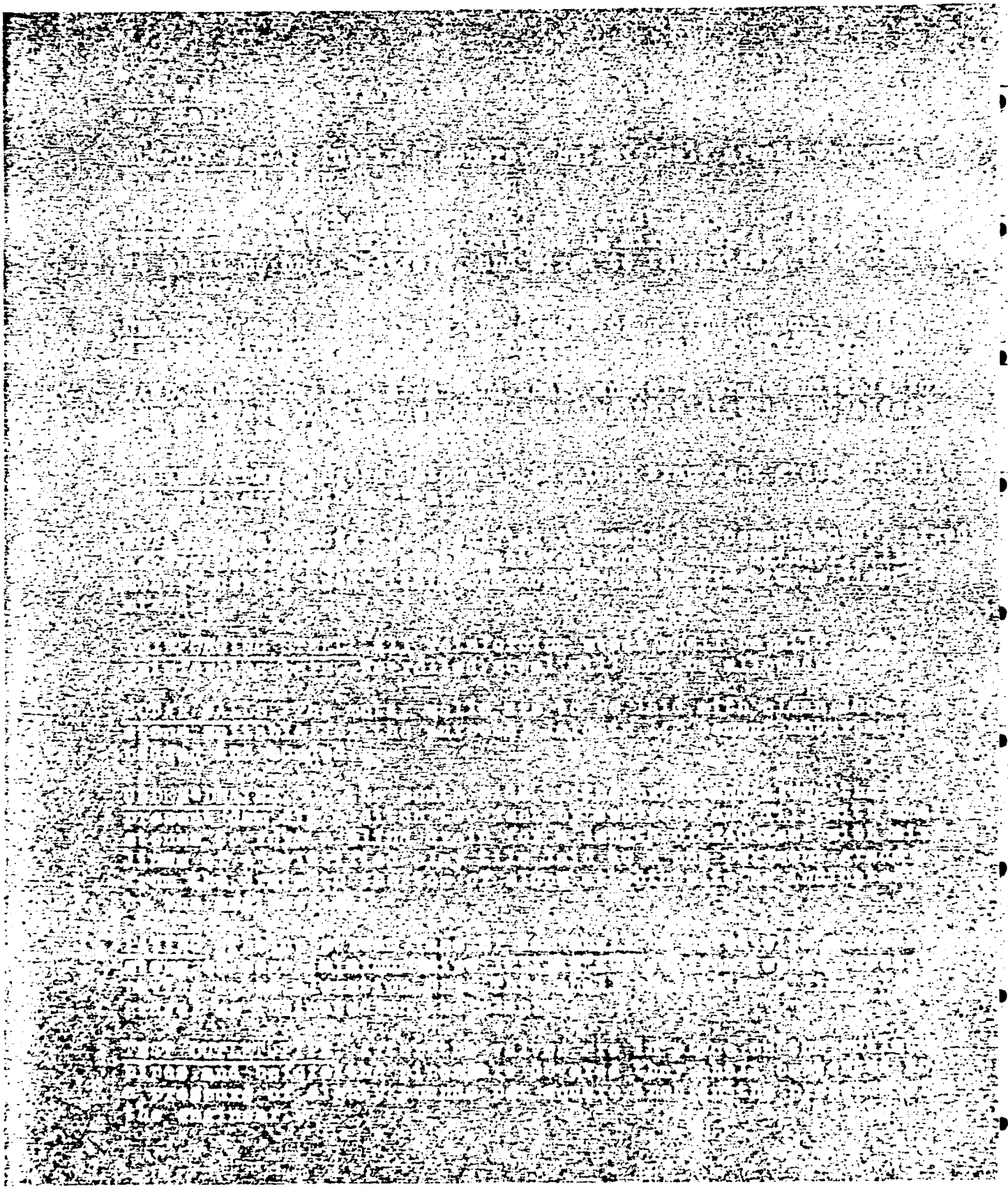
SPECIFICATIONS FOR ENLARGING DAM IN 1929



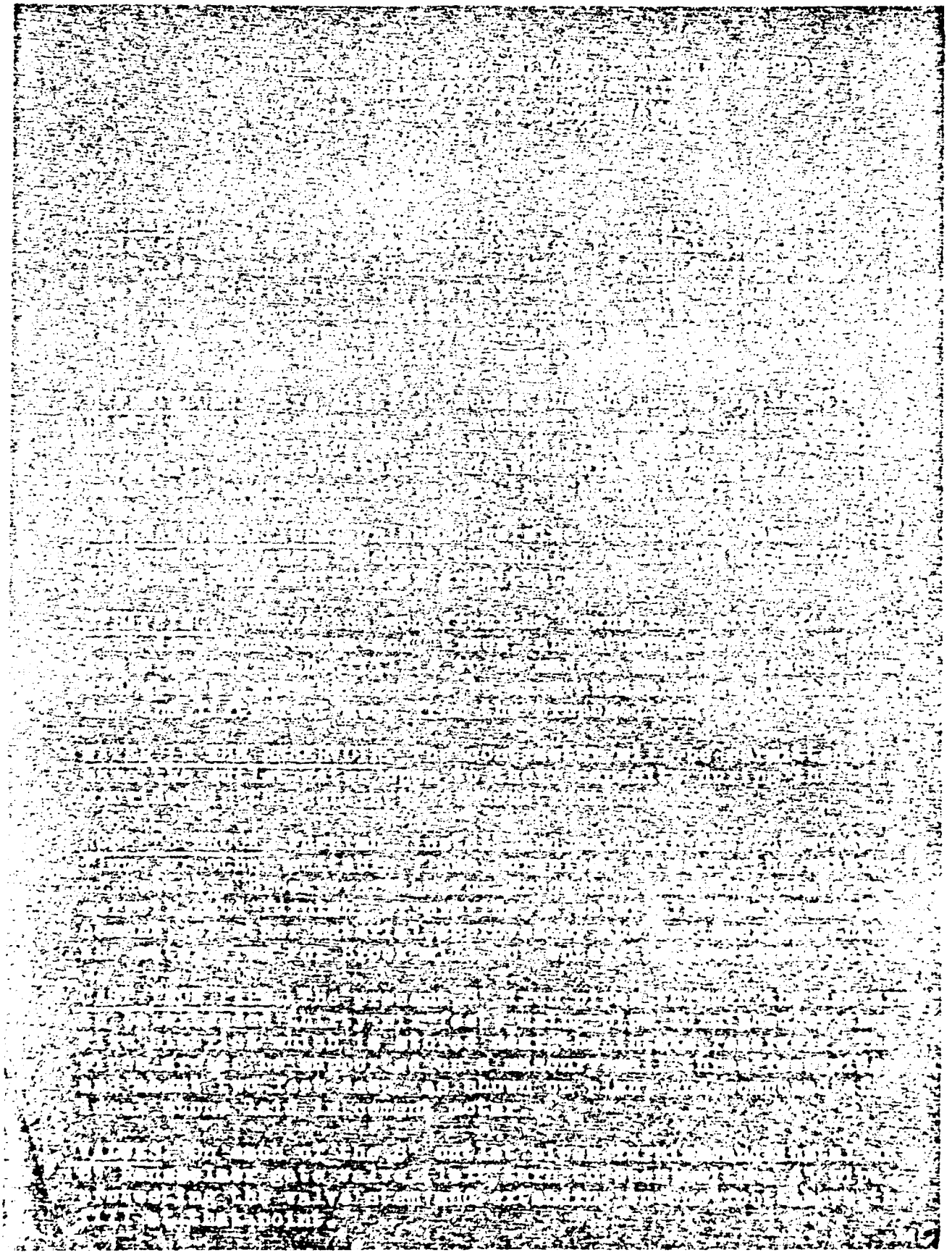
SPECIFICATIONS FOR ENLARGING DAM IN 1929



SPECIFICATIONS FOR ENLARGING DAM IN 1929



SPECIFICATIONS FOR ENLARGING DAM IN 1929



1. VIEW ALONG CENTERLINE OF THE DAM FROM THE NORTH ABUTMENT. (12/3/80)

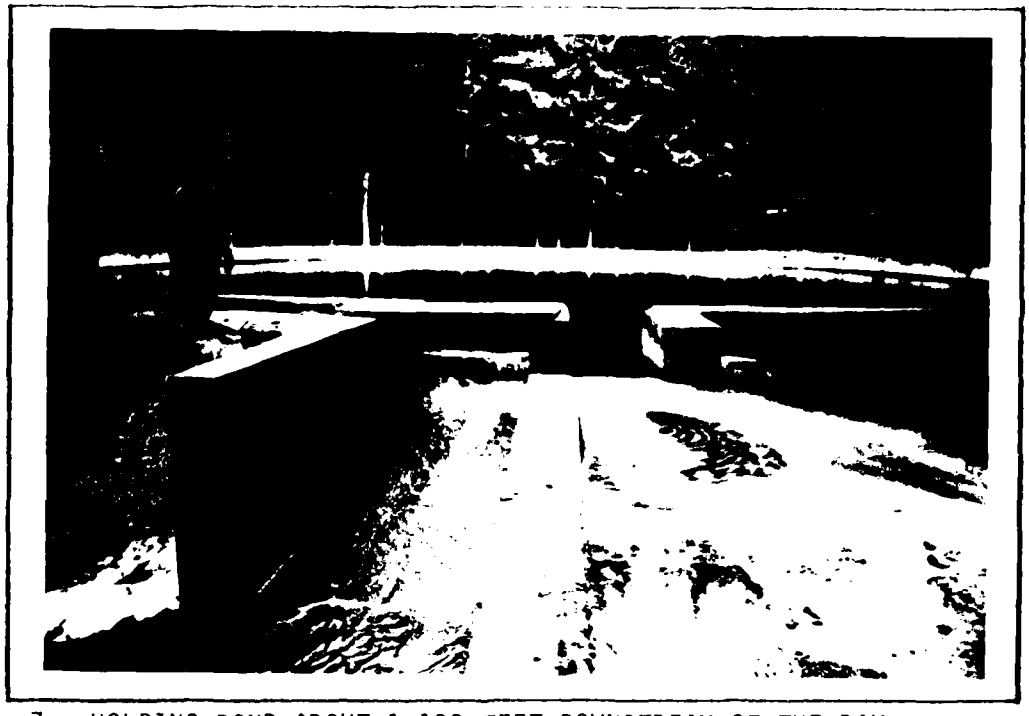
2. DOWNSTREAM FACE OF THE SPILLWAY SHOWING FLASH BOARDS IN PLACE. (12/3/80)

3. GATEHOUSE AT THE DOWNSTREAM TOE OF THE DAM. (12/3/80)

4. LOW LEVEL OUTLET AT THE DOWNSTREAM TOE OF THE DAM. (12/3/80)

5. TYPICAL LINED CHANNEL DOWNSTREAM OF THE SPILLWAY OUTLET CHANNEL. (12/3/80)

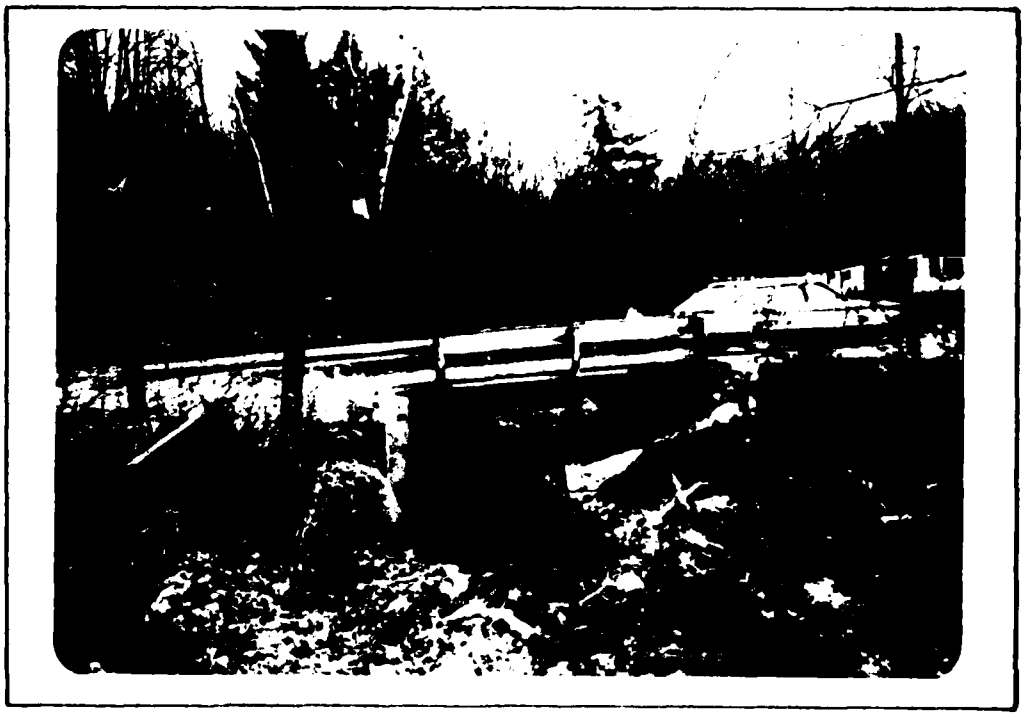
6. TYPICAL UNLINED CHANNEL DOWNSTREAM OF THE SPILLWAY OUTLET CHANNEL. (12/3/80)



7. HOLDING POND ABOUT 1,100 FEET DOWNSTREAM OF THE DAM. (12/3/80)

8. POTENTIAL DAMAGE AREA ABOUT 3,500 FEET DOWNSTREAM OF THE DAM. (12/3/80)

9. POTENTIAL DAMAGE AREA ABOUT 3,500 FEET DOWNSTREAM OF THE DAM. (12/3/80)



10. ROAD CROSSING OVER DOWNSTREAM CHANNEL APPROXIMATELY 3,600 FEET DOWNSTREAM OF THE DAM. (12/3/80)

APPENDIX D

HYDROLOGIC AND HYDRAULIC ENGINEERING DATA

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

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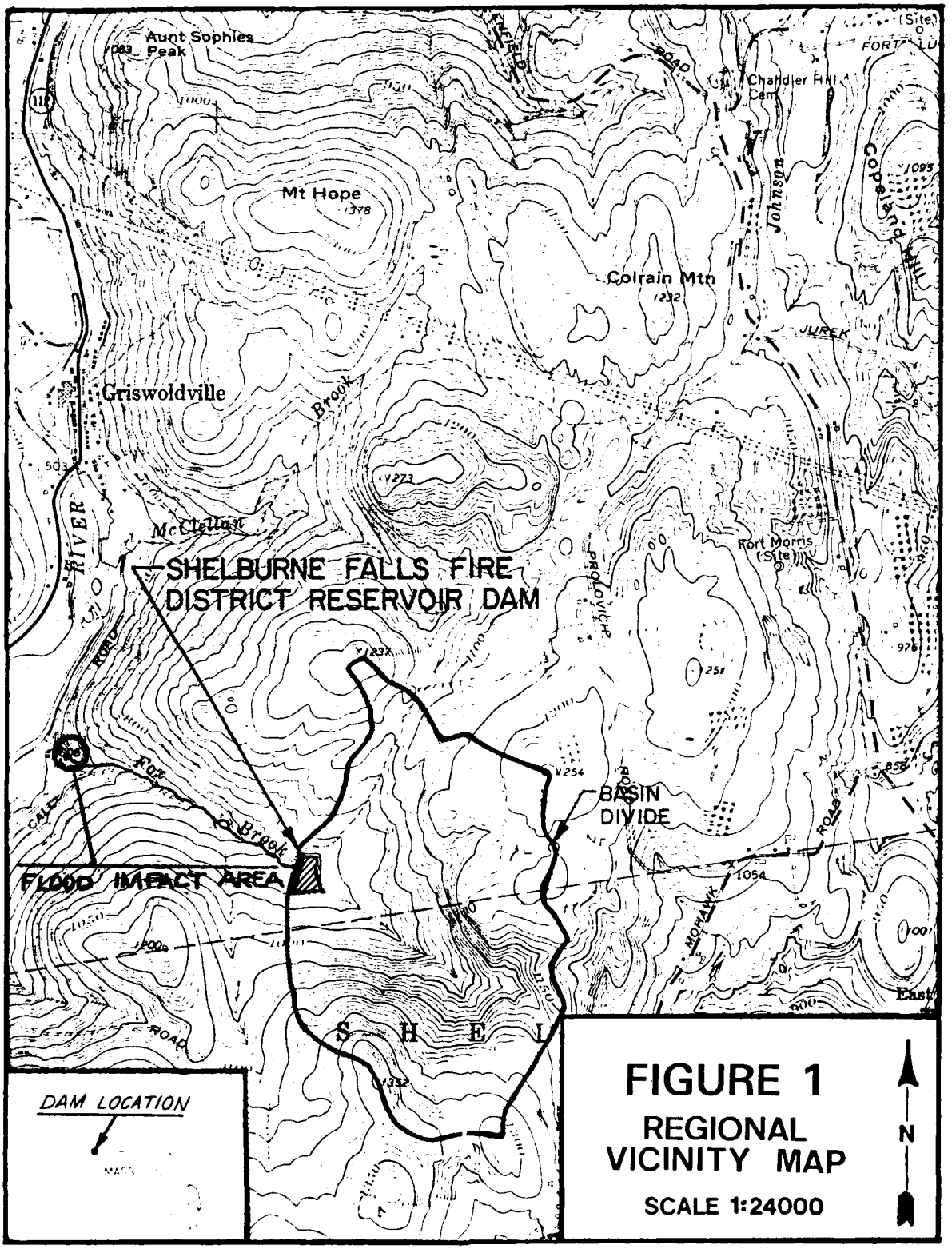
HEC-1 Dam Safety Version, Breach Computer Output	D-10 through D-13


Aunt Sophies Peak
Mt Hope
1378
Griswoldville
Colrain Mtn
1232
Chandler Hill Cem
Johnson
Copeland Hill
McClellan
SHELBURNE FALLS FIRE DISTRICT RESERVOIR DAM
Fort Morris (Site)
BASIN DIVIDE
FLOOD IMPACT AREA
DAM LOCATION
S H E L
FIGURE 1
REGIONAL VICINITY MAP
SCALE 1:24000
N

BRYANT ASSOCIATES, INC.
648 Beacon Street
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(617) 247-1800

JOB NED COE, SHELBURNE FALLS FIRE DISTRICT I
SHEET NO D- 2 OF
CALCULATED BY D.M. DATE JAN 23 81
CHECKED BY DATE 3/6/81
SCALE

SHELBURNE FALLS FIRE DISTRICT RESERVOIR DAM.

DRAINAGE AREA = 0.6 Sq. Mi

$C_t = 2.0$ $C_p = 0.6$

T_p COMPUTATIONS.

$L = 0.92$ Mi , $L_{Ca} = 0.36$ Mi

$T_p = C_t (L \times L_{Ca})^{0.3}$

$T_p = 2.0 (0.92 \times 0.36)^{.3} =$ 1.45 Hours. $\approx$ 1.5 Hours

PMP DATA

FROM HMS #33 The 24 Hour 200 Sq. Mi INDEX Rainfall IS: 20.2 INCHES

6 Hr % = 111

12 Hr % = 124

24 Hr % = 133

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JOB SHELBURNE FALLS FIRE DISTRICT DAM
SHEET NO D-3 OF
CALCULATED BY D.M. DATE 1-28-81
CHECKED BY [illegible], ADH DATE 3/6/81
4/23/81
SCALE

STAGE - DISCHARGE.

Q_1 = FLOW FROM SPILLWAY (Sharp-CRESTED), $L_1 = 275'$

Q_2 = FLOW OVER CREST OF DAM $Q_2 = CLH^{1.5} = 2.7 \times L_2 \times H^{1.5} = 1323H^{1.5}$

Q_1 will be computed according to Bazin's Formula*, pg 20-17 Seelye, Design, Vol I

Q_2 will be Computed as broad-Crested weir

Elev.	H_1	$L_1 \times g = G_1$	H_2	L_2	Q_2	$Q_1 + Q_2$
847	0	0	—	—	0	0
847.5	0.5	33	—	—	—	33
848	1.0	94	—	—	—	94
848.5	1.5	173	—	—	—	173
849	2.0	271	—	—	—	271
849.8	2.8	462	0	0	0	462
850	3.0	515	0.2	491	119	634
851	4.0	818	1.2	495	1,757	2,575
852	5.0	1,173	2.2	500	4,405	5,578
853	6.0	1,579	3.2	504	7,790	9,369

*Note: The height of weir (P) was estimated to be 4 feet.

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JOB SHELBURNE FALLS FIRE DISTRICT DAM
SHEET NO D-4 OF
CALCULATED BY D.M. DATE 1-28-81
CHECKED BY JB DATE 3/6/81
SCALE

STAGE - STORAGE

ELEVATION	AREA (ACRES)	STORAGE (ACRE-FEET)
821.0	0	0
847.0 FLASHBOARDS	4.0	34
849.8 CREST OF DAM	5.5	48
851.8	6.0	58

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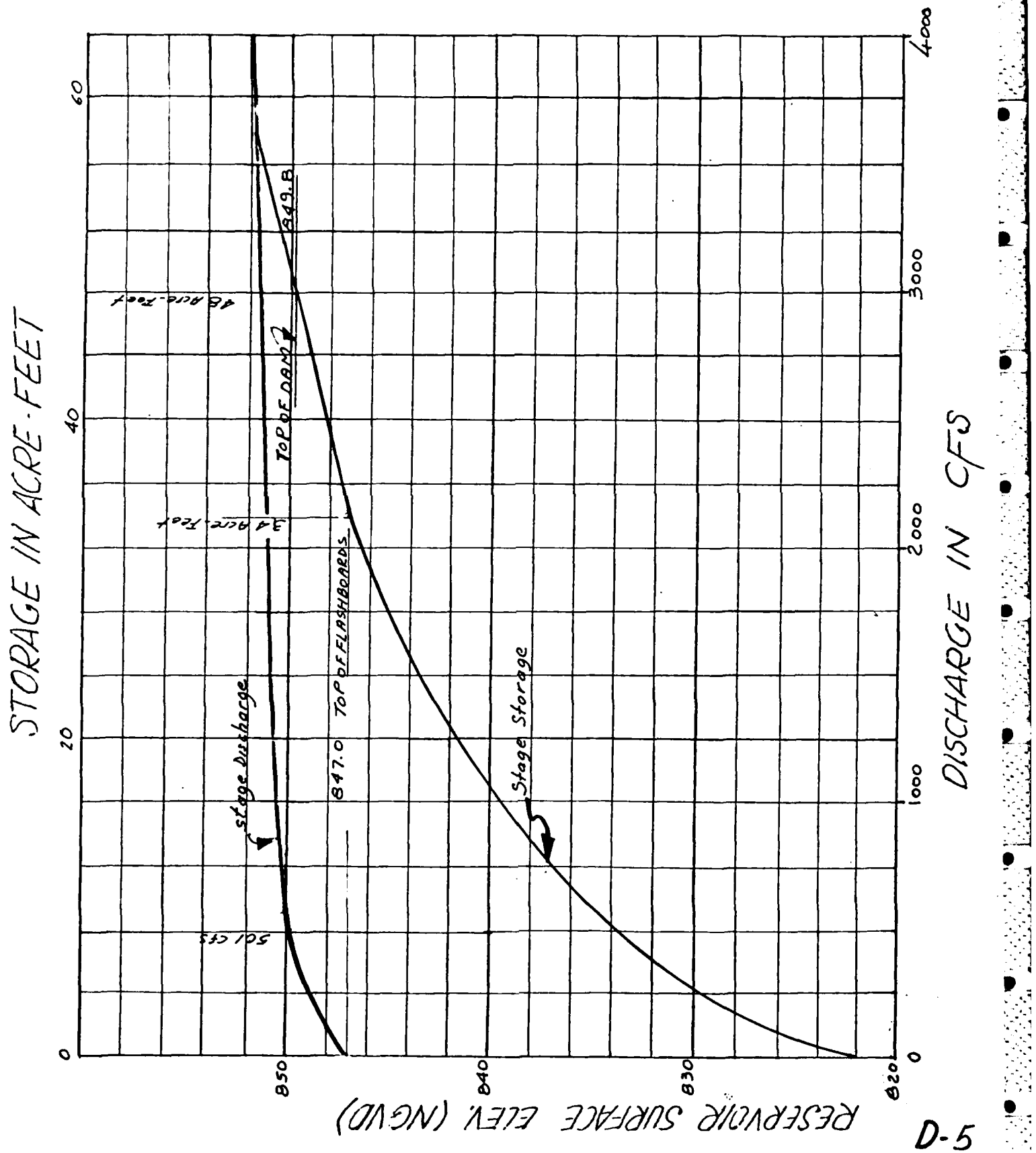
JOB SHELBURNE FALLS FIRE DISTRICT DAM
SHEET NO D-5 OF
CALCULATED BY D. M DATE 2-28-81
CHECKED BY [illegible] DATE 3/6/81
SCALE



D-5

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BOSTON, MASSACHUSETTS 02215
(617) 247-1800

JOB SHELBURNE FALLS FIRE DISTRICT DAM
SHEET NO D-6 OF
CALCULATED BY D. M. DATE 1-28-81
CHECKED BY [illegible] DATE 3/6/81
SCALE

```
1**********
 FLOOD HYDROGRAPH PACKAGE (HEC 1)
 DAM SAFETY VERSION      JULY 1978
   LAST MODIFICATION  01 APR 80
 **********
     1                A1       HYDROLOGIC ANALYSIS OF SHELBURNE FALLS FIRE DISTRICT DAM
     2                A2                  NATIONAL DAM INSPECTION PROGRAM
     3                A3            NEW ENGLAND DIVISION  CORPS OF ENGINEERS
     4                B     300        0       10        0        0        0        0        0       -4        0
     5                B1      5
     6                J       1        1        1
     7                J1    .33
     8                K       0   INFFDP                                    1
     9                K1                    INFLOW TO FIRE DISTRICT POND
    10                M       1        1      .60                 0                                  1
    11                P       0     20.2      111      124      133
    12                T                                                    0     0.05
    13                W    1.45      0.6
    14                X    -1.7     -0.1        2
    15                K       1   ROFFDP                                    1
    16                K1                  ROUTED OUTFLOW OF FIRE DISTRICT POND
    17                Y                                  1        1
    18                Y1      1                                          -847       -1
    19                Y4    847    847.5      848    848.5      849    849.8      850      851      852      853
    20                Y5      0       33       94      173      271      462      634     2575     5578     9369
    21                $A      0        4      6.4
    22                $E  821.8      847      853
    23                $$    847
    24                $D  849.8
    25                K      99
1                                PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                                     RUNOFF HYDROGRAPH AT       INFFDP
                                     ROUTE HYDROGRAPH TO        ROFFDP
                                     END OF NETWORK
```

HYDROLOGIC ANALYSIS OF SHELBURNE FALLS FIRE DISTRICT DAM
NATIONAL DAM INSPECTION PROGRAM
NEW ENGLAND DIVISION CORPS OF ENGINEERS

JOB SPECIFICATION

JD	NMIN	IMAIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	10	0	0	0	0	0	-4	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

FLOOD PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 1 LRTIO= 1

D-7

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW TO FIRE DISTRICT POND

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
INFFDP		0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.60	0.00	.60	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	20.20	111.00	124.00	133.00	0.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .300

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	0.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 1.45 CP= .60 NTA= 0

RECESSION DATA

STRTQ= -1.70 QRCSN= -.10 RTIOR= 2.00

UNIT HYDROGRAPH 52 END-OF-PERIOD ORDINATES, LAG= 1.46 HOURS, CP= .60 VOL= 1.00

5.	22.	44.	70.	98.	124.	144.	158.	163.	159.
145.	129.	115.	103.	91.	82.	73.	65.	58.	51.
46.	41.	36.	33.	29.	26.	23.	21.	18.	16.
15.	13.	12.	10.	9.	8.	7.	6.	6.	5.
5.	4.	4.	3.	3.	3.	2.	2.	2.	2.
1.	1.								

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q

SUM 21.49 20.29 1.20 42342.
(546.)(515.)(30.)(1340.23)

D-8

HYDROGRAPH ROUTING

ROUTED OUTFLOW OF FIRE DISTRICT POND

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
ROFFDP	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-847.	-1

STAGE	847.00	847.50	848.00	848.50	849.00	849.80	850.00	851.00	852.00	853.00
FLOW	0.00	33.00	94.00	173.00	271.00	462.00	634.00	2575.00	5578.00	9362.00
SURFACE AREA=	0.	4.	6.							
CAPACITY=	0.	34.	65.							
ELEVATION=	822.	847.	853.							

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
847.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
849.8	0.0	0.0	0.

PEAK OUTFLOW IS 519. AT TIME 17.00 HOURS

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 .33
HYDROGRAPH AT	INFFDP	.60	1	521.
		(1.55)		(14.74)(
ROUTED TO	ROFFDP	.60	1	519.
		(1.55)		(14.69)(

RATIOS APPLIED TO FLOWS

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	847.00	847.00	849.80
STORAGE	34.	34.	46.
OUTFLOW	0.	0.	462.

D-9

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.33	849.87	0.07	48	519.	1.00	17.00	0.00

```
1*********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  01 APR 80
*********************************
         A1   HYDROLOGIC ANALYSIS OF SHELBURNE FALLS FIRE DISTRICT DAM BREACH
         A2                      NATIONAL DAM INSPECTION PROGRAM
         A3               NEW ENGLAND DIVISION  CORPS OF ENGINEERS
         B      300       0      10       0       0       0       0       0      -4       0
         B1       5
         J        2       1       1
         J1     .33
         K        0  INFFDP                                       1
         K1                      INFLOW TO FIRE DISTRICT POND
         M        1       1     .60               0                               1
         P        0    20.2     111     124     133
         T                                                        0    0.05
         W      1.5     0.6
         X     -1.7    -0.1       2
         K        1  ROFFDP                                       1
         K1                  ROUTED OUTFLOW OF FIRE DISTRICT POND
         Y                                1       1
         Y1       1                                            -847      -1
         Y4     847   847.5     848   848.5     849   849.8     850     851     852     853
         Y5       0      33      94     173     271     462     634    2575    5578    9369
         $A       0       4     6.4
         $E   821.8     847     853
         $$     847
         $D   849.8
         $B     100    0.01   824.0     .25     847   849.8
         $B     100    0.01   824.0     .25     847     860
         K        1  ROFHAR                                       1
         K1                      CHANNEL ROUTING TO HAZARD AREA
         Y                                1       1
         Y1       1                                              -1
         Y6    0.06    0.04    0.06     498     510    3500    0.09
         Y7       0     510      50     500      72     499      73     498      78     498
         Y7      79     499     100     500     150     510
         K       99
1                  PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                           RUNOFF HYDROGRAPH AT        INFFDP
                           ROUTE HYDROGRAPH TO         ROFFDP
                           ROUTE HYDROGRAPH TO         ROFHAR
                           END OF NETWORK

            HYDROLOGIC ANALYSIS OF SHELBURNE FALLS FIRE DISTRICT DAM BREACH
                             NATIONAL DAM INSPECTION PROGRAM
                         NEW ENGLAND DIVISION  CORPS OF ENGINEERS

                                    JOB SPECIFICATION
          NQ       NHR      NMIN      IDAY       IHR      IMIN     METRC      IPLT      IPRT     NSTAN
         300         0        10         0         0         0         0         0        -4         0
                                     JOPER       NWT     LROPT     TRACE
                                         5         0         0         0

                              MULTI PLAN ANALYSES TO BE PERFORMED
                                 NPLAN= 2 NRTIO= 1 LRTIO= 1
```

D-10

SUB-AREA RUNOFF COMPUTATION

INFLOW TO FIRE DISTRICT POND

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
INFFDP		0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.60	0.00	.60	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	20.20	111.00	124.00	133.00	0.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	0.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 1.50 CP= .60 NTA= 0

RECESSION DATA

STRTQ= -1.70 QRCSN= -.10 RTIOR= 2.00

UNIT HYDROGRAPH 53 END-OF-PERIOD ORDINATES, LAG= 1.50 HOURS, CP= .61 VOL= 1.00

6.	21.	42.	66.	93.	118.	138.	152.	159.	157.
145.	130.	116.	104.	93.	83.	74.	66.	59.	53.
47.	42.	38.	34.	30.	27.	24.	22.	19.	17.
15.	14.	12.	11.	10.	9.	8.	7.	6.	6.
5.	5.	4.	4.	3.	3.	3.	2.	2.	2.
2.	1.	1.							

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	21.49	20.29	1.20	47319.
										(546.)(515.)(30.)(1339.92)			

HYDROGRAPH ROUTING

ROUTED OUTFLOW OF FIRE DISTRICT POND

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
ROFFDP		1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-847.	-1

STAGE	847.00	847.50	848.00	848.50	849.00	849.80	850.00	851.00	852.00	853.00
FLOW	0.00	33.00	94.00	173.00	271.00	462.00	634.00	2575.00	5578.00	[illegible]

D-11

CAPACITY	0.	34.	65.
ELEVATION	847.	847.	853.

CREL	SPWID	COOR	EXPW	ELEVL	COOL	CAREA	EXPL
847.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOEL	COOD	EXPD	DAMWID
849.8	0.0	0.0	0.

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
100.	.01	824.00	.25	847.00	849.80

BEGIN DAM FAILURE AT 17.00 HOURS

PEAK OUTFLOW IS 5427. AT TIME 17.16 HOURS

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
100.	.01	824.00	.25	847.00	860.00

PEAK OUTFLOW IS 512. AT TIME 17.17 HOURS

HYDROGRAPH ROUTING

CHANNEL ROUTING TO HAZARD AREA

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
ROEHAR	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME *ROUTING DATA*

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0600	.0400	.0600	498.0	510.0	3500.	.09000

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC

0.00 510.00 50.00 500.00 72.00 499.00 73.00 498.00 78.00 498.00
79.00 499.00 100.00 500.00 150.00 510.00

STORAGE	0.00	.29	.75	2.37	5.00	7.96	11.25	14.85	18.78	23.03
	27.59	32.48	37.69	43.22	49.07	55.24	61.73	68.54	75.67	83.12
OUTFLOW	0.00	25.84	90.61	259.79	634.21	1191.56	1920.32	2821.93	3900.72	5162.33
	6613.11	8259.78	10109.22	12168.43	14444.42	16944.18	19674.69	22642.88	25855.61	29319.70
STAGE	498.00	498.63	499.26	499.89	500.53	501.16	501.79	502.42	503.05	503.68
	504.32	504.95	505.58	506.21	506.84	507.47	508.11	508.74	509.37	510.00
FLOW	0.00	25.84	90.61	259.79	634.21	1191.56	1920.32	2821.93	3900.72	5162.33
	6613.11	8259.78	10109.22	12168.43	14444.42	16944.18	19674.69	22642.88	25855.61	29319.70

MAXIMUM STAGE IS 502.8

MAXIMUM STAGE IS 500.3

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATION
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .33
HYDROGRAPH AT	INFLW	.60 (1.55)	1	513. (14.53)(
			2	513. (14.53)(
ROUTED TO	ROFFDF	.60 (1.55)	1	5295. (149.94)(
			2	512. (14.50)(
ROUTED TO	ROFHAR	.60 (1.55)	1	3421. (96.87)(
			2	511. (14.47)(

1

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	847.00	847.00	849.80
STORAGE	34.	34.	46.
OUTFLOW	0.	0.	462.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.33	849.86	.06	47.	5427.	.20	17.16	17.00

PLAN 2 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	847.00	847.00	849.80
STORAGE	34.	34.	46.
OUTFLOW	0.	0.	462.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.33	849.86	.06	47.	512.	.83	17.17	0.00

PLAN 1 STATION ROFHAR

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.33	3421.	502.8	17.17

PLAN 2 STATION ROFHAR

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
	511.	500.3	17.17

END

FILMED

8-85

DTIC